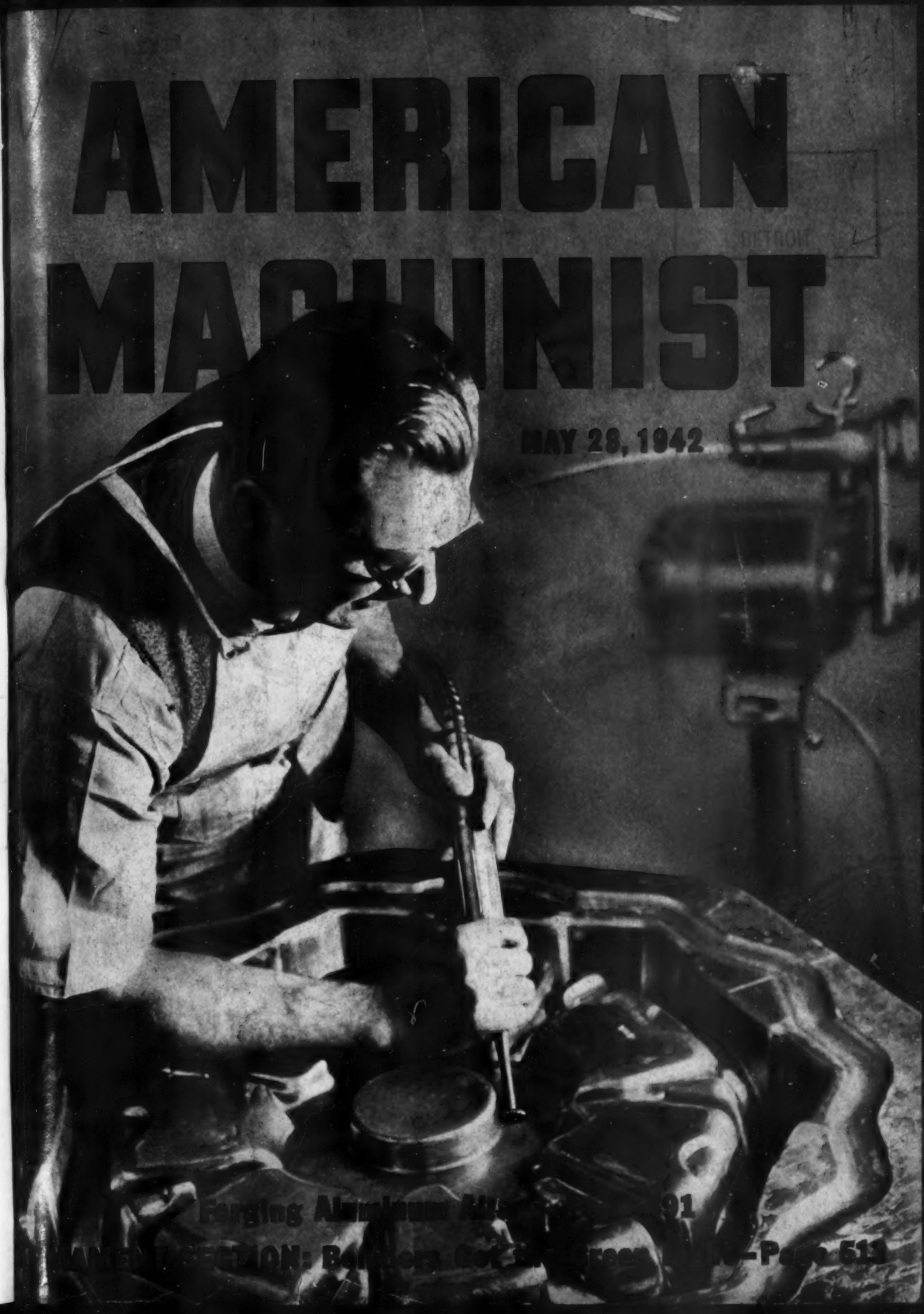
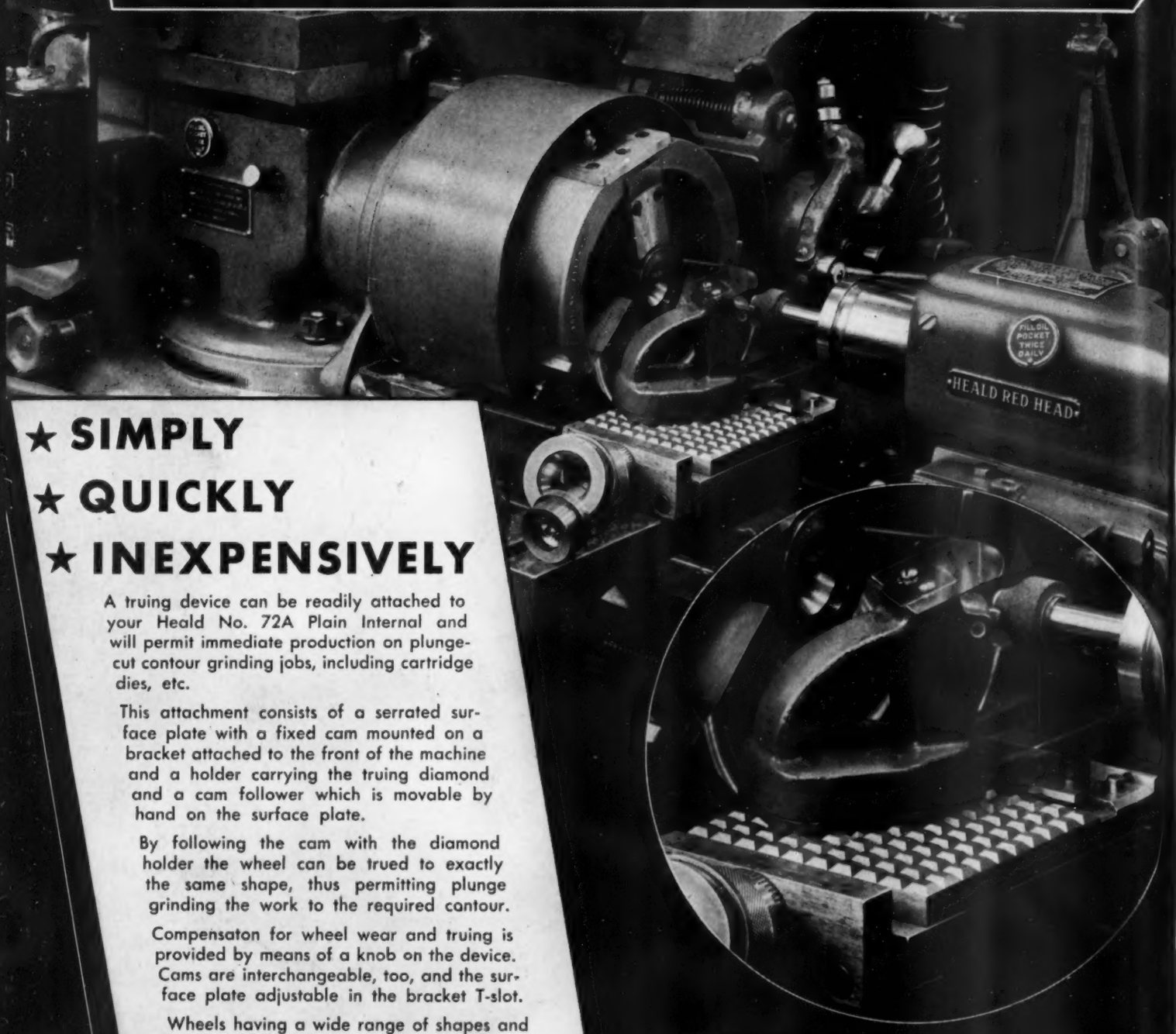

AMERICAN
MACHINIST
MAY 28, 1942

Lick Your Contour Grinding Jobs with your present HEALD INTERNAL



★ SIMPLY
★ QUICKLY
★ INEXPENSIVELY

A truing device can be readily attached to your Heald No. 72A Plain Internal and will permit immediate production on plunge-cut contour grinding jobs, including cartridge dies, etc.

This attachment consists of a serrated surface plate with a fixed cam mounted on a bracket attached to the front of the machine and a holder carrying the truing diamond and a cam follower which is movable by hand on the surface plate.

By following the cam with the diamond holder the wheel can be trued to exactly the same shape, thus permitting plunge grinding the work to the required contour.

Compensaton for wheel wear and truing is provided by means of a knob on the device. Cams are interchangeable, too, and the surface plate adjustable in the bracket T-slot.

Wheels having a wide range of shapes and sizes can therefore be trued for grinding all kinds of contour work.

Contact us at Worcester or one of our branch offices in your locality for details.

By means of the contour truing attachment furnished on this Heald No. 72A Plain Internal form wheels for plunge contour grinding various types of cartridge dies can be easily and quickly trued to the exact shapes desired.

THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.

AMERICAN MACHINIST

May 28, 1942

The Final Touch—A die used in the forging of aircraft engine crankcase sections receives a finish polishing

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VOLUME 86 NUMBER 11

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★ ALL-OUT *for* CONVERSION!

AMERICAN MACHINIST

If you are working on war contracts, or expect to be, you can't afford to miss giving the next issue of American Machinist your closest attention.

This coming June 11th "MOTOR CARS to MUNITIONS" number will be entirely devoted to a detailed report (within censorship limits) of the latest armament conversion methods being practiced by the automotive plants of America. As a handbook on "how to do it quickly and efficiently", it will answer questions and save untold time and effort for any Metal-Working executive changing over to war production.

Each successive order out of Washington limiting civilian metal-goods manufacture has intensified the need for such a textbook. As Metal-Working goes all-out for conversion, American Machinist is on the job with timely, helpful information.

Make a note right now to watch for this June 11th "MOTOR CARS to MUNITIONS" number. You'll want to study it and use it for months to come.

★ "MOTOR CARS *to* MUNITIONS"

June 11th Issue

Announcing

THE NEW GLEASON AUTOMATIC SURFACE HARDENING MACHINE

FOR HARDENING GEAR TEETH WITH OXY-ACETYLENE FLAME

With this new machine all the advantages of flame hardening are profitably extended to medium and small-size bevel, spur and internal gears, sprockets and the like.

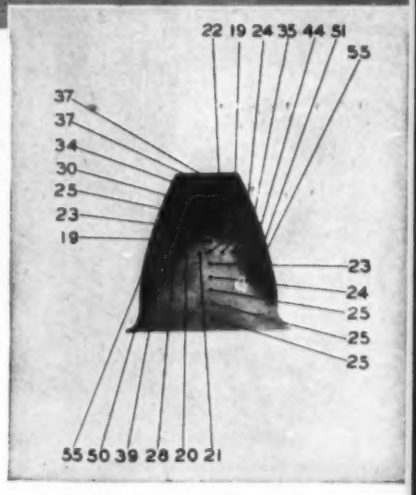
Both sides of a tooth are hardened simultaneously without distortion. Each tooth is hardened in exactly the same length of time and to the same depth as every other tooth. The machine is fully automatic in operation including indexing from tooth to tooth.

Straight-line cams guide the burners along the tooth, and on spiral bevel and helical gears the work rolls in timed relation to the torch advance so that the burners accurately follow the lengthwise tooth curve. Hydraulic control varies the burner speed to allow for heat accumulation ahead of the burners and on bevel gears to compensate for the taper of the teeth; the control also increases the burner speed at the ends of the teeth to prevent overheating.

Write for complete information.

CAPACITY

Pitch Dia., maximum	
Bevel Gears	33"
Spur and Helical Gears	26"
Internal Gears	21½"
Pitch, maximum	1½ DP
Face Width, maximum	4"
Floor Space	36" x 58"



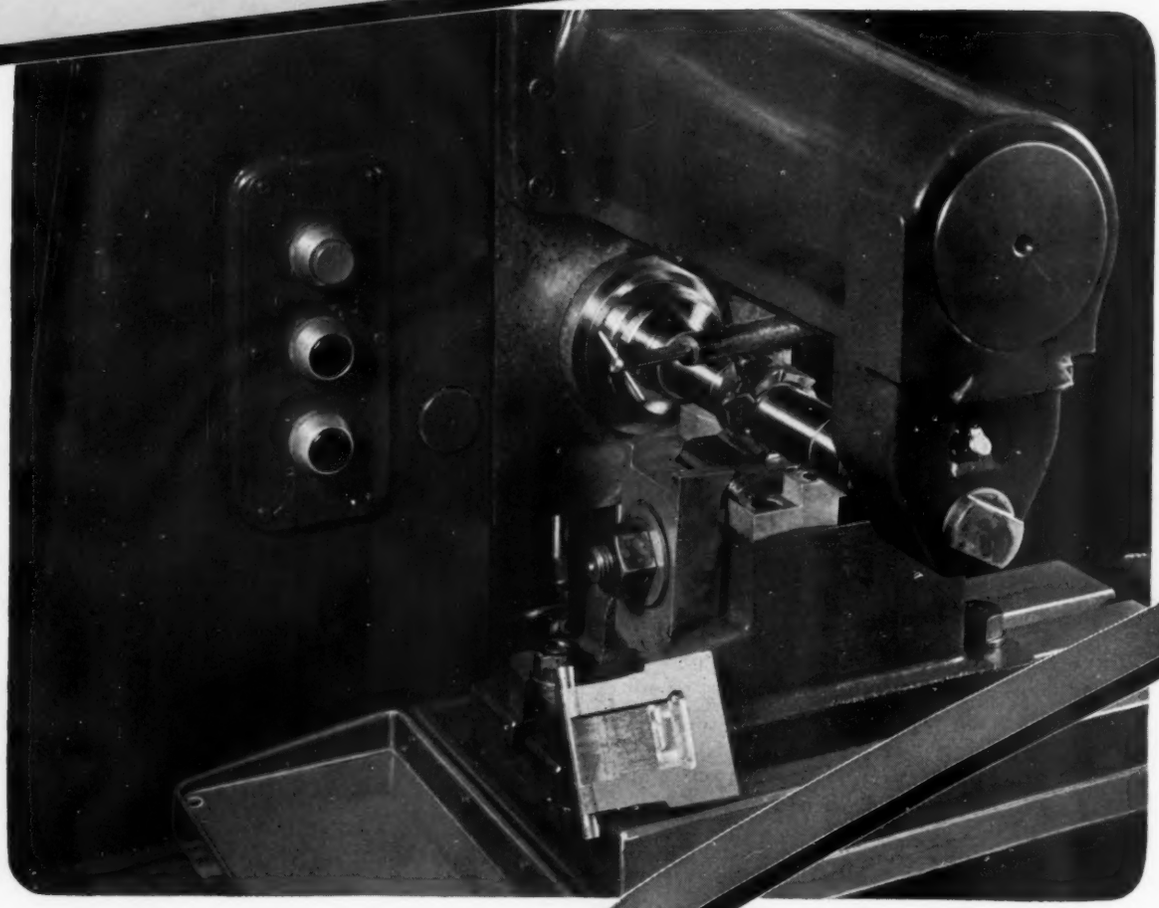
Etched cross-section of hardened gear tooth. Rockwell "C" readings show gradual change from hard, durable tooth surface to tough, shock-resistant core.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

IF IT'S LOW COST OPERATION



Milling a groove in a gun locking device. A good example of how all the functions of the CINCINNATI 0-8 equipped with automatic Rise and Fall Spindle Carrier are coordinated.

Buy CINCINNATI No. 0-8 PLAIN AUTOMATIC MILLING MACHINES

YOU WANT . . . .

CINCINNATI

WIN *with a Cincinnati!*

The production of small parts in big quantities at low cost is the result of developing the CINCINNATI No. 0-8 Plain Automatic Milling Machine to its present high degree of efficiency. By equipping the 0-8 with an automatic Rise and Fall Spindle Carrier timed with the table movement, Cincinnati engineers have made it possible to mill blind cuts in small parts rapidly, accurately and automatically. Production has been further stepped up by a power rapid traverse of 400" per minute for the table, which reduces lost time between cuts.

And don't think the 0-8 is a single purpose installation. On the contrary, it is capable of milling an extremely wide range of small parts. This versatility is achieved with the cycle selectors by which almost any conceivable operating cycle may be automatically established. Changing from one cycle to another requires only a minute or two.

The 0-8 handles easily because it is completely automatic and practically independent of the operator. You don't have to hire a toolmaker or a skilled mechanic to keep the machine loaded.

So, if you mill small parts and are interested in Low Cost Operation, buy CINCINNATI No. 0-8 Plain Automatic Milling Machines. Specification catalog M-964 giving complete information on all features and their benefits will be sent on request. Write for your copy today.

THE CINCINNATI MILLING MACHINE CO.

Cincinnati, Ohio U. S. A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES
SURFACE BROACHING MACHINES • CUTTER SHARPENING MACHINES

From the dusty courthouse steps came the chant of a slave auctioneer. Inside, the Mayor and the Board of Aldermen were absorbed in the gravity of civic affairs.

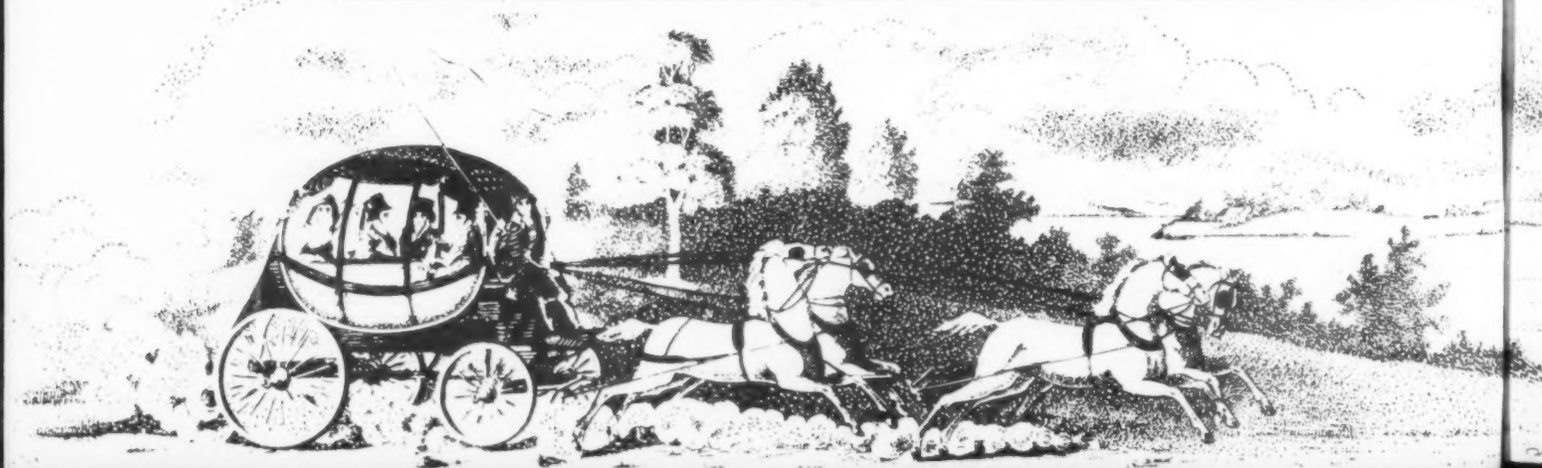
With the development of the steamboat, they argued, the slave and fur trade of their frontier post would soon give way to commerce of greater importance. The village of St. Louis, they prophesied with pride, would some day be a sizeable town . . . Now, what this promising municipality needed was a modern waterworks! One with a steam-driven pump!

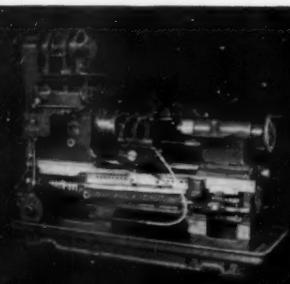
That was in 1829. A year later, in a Vermont village more than 1000 miles away, the National Hydraulic Company completed "a huge revolving engine of 20 horsepower," capable of raising "sweet and pleasant water" from the muddy Mississippi to a reservoir 104 feet above the normal level of the river.

Indians menaced the Western frontier, and the first railroad was still to be built. Yet, undaunted by danger or distance, the company delivered the pump—and the story of its shipment has become a transportation legend.

Accompanied by its inventor, the "huge engine" was freighted across the mountains in a four-horse wagon. From Albany it traveled to Buffalo by packet on the new Erie Canal, and from Buffalo by steamboat to a settlement called Chicago. Again horses hauled the load across the prairie to the frontier post of Rock Island. And from there it finished the tortuous journey by flatboat, on the great river whose "sweet and pleasant water" it was destined to pump for many years.

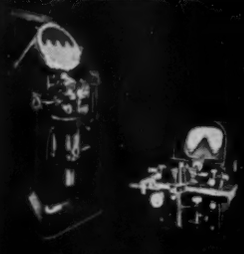
Two years from the receipt of the order the company's inventor was back on the job . . . and he'd brought with him another order to fill! Yankee ingenuity and *service* had opened a new frontier.





FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

By Wagon, Canal, Lake and River — A Tradition of SERVICE is Founded!

Jones & Lamson Machine Company is a direct descendant of the old National Hydraulic Company—and its policy of "staying with the job" from order to installation is a tradition.

The services of this company's staff of engineering experts have helped to open many new frontiers of industry . . . and today, with the future a frontier more formidable and uncertain than any in the industrial history of our nation, it is *service* that will help to see you through.

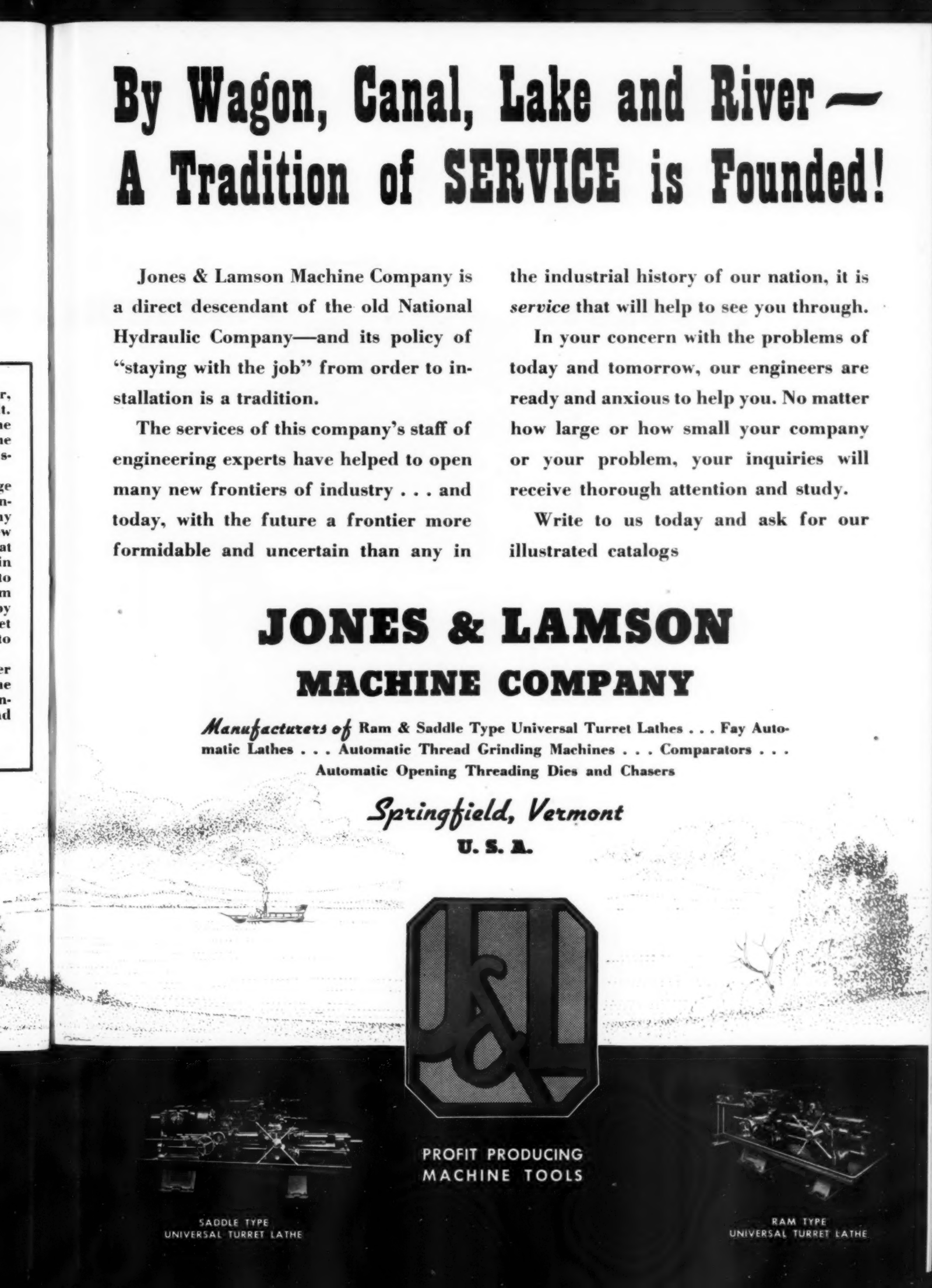
In your concern with the problems of today and tomorrow, our engineers are ready and anxious to help you. No matter how large or how small your company or your problem, your inquiries will receive thorough attention and study.

Write to us today and ask for our illustrated catalogs

JONES & LAMSON
MACHINE COMPANY

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

Springfield, Vermont
U. S. A.



INVOLUTE MEASUR

This No. 24, and other Fellows Involute Measuring Machines, not only check and chart the accuracy of the involute profile, but also disclose and measure high fillets, undercut, and tip modifications. They provide a simple means for determining a base circle of unknown diameter.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTION

UR ING FOR

Tank...Truck...Tractor **GEARS**

The new No. 24 extends the range of Fellows Involute Measuring Machines to gears up to 24 inches pitch diameter—spur, helical or herringbone, and internal as well as external. These machines operate on a basic principle, dispensing with sine bars, base rolls etc; and require no difficult calculations. Settings for various base circle radii are made with standard size blocks. Visual readings are in tenths of a thousandth on a dial indicator. Electrical chart recording of similar sensitivity and magnification is used where records are wanted for study or permanent reference . . . For details, write The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.

IF IT'S *LOW COST*

T OPERATION YOU WANT

BUY CINCINNATI HYDRAULIC UNIVERSAL GRINDING MACHINES

Here's a grinding machine in which maintenance has been practically eliminated. The CINCINNATI Hydraulic Universal is seldom if ever down for repairs. This means extremely low cost of operation and, more importantly, continuous, unfailing service over a long period of time.

In CINCINNATI Hydraulic Universals there are many features designed to save valuable production hours and speed deliveries. For example: FIL-MATIC Spindle Bearings give a more rigid and accurate support to the spindle at all times. This means there will be no seizure, no breakdown, and the complete elimination of spindle flutter.

Another is the hinged Internal Grinding Attachment driven by an independent motor. Standard equipment and permanently affixed, this attachment makes internal grinding a routine job. You simply swing the Internal Grinding Attachment down and tighten one hold-down bolt. Even an inexperienced man can do this without supervision. A further contribution to low cost operation.

To have your toolroom equipment laid up for repairs in times of peace is serious enough, but during an emergency it may prove well nigh disastrous. You just can't afford to have such a thing happen very many times. So, if it's Low Cost Operation you want, together with all it implies, buy CINCINNATI Hydraulic Universal Grinding Machines. They are available in 12″, 14″, 16″, and 18″ swings; between-center distances up to 72″.

Specification catalogs G-486 and G-474 give complete information on all features and their benefits. Send for your copies today or look in Sweet's Catalog File for mechanical industries.

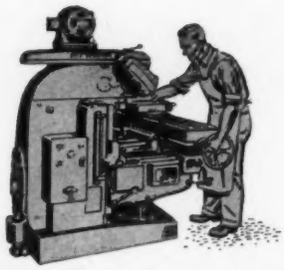
CINCINNATI

WIN *with a Cincinnati!*

CINCINNATI GRINDERS INCORPORATED

Cincinnati, Ohio U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES



OPERATORS ALWAYS HAVE

"Control of the Situation"

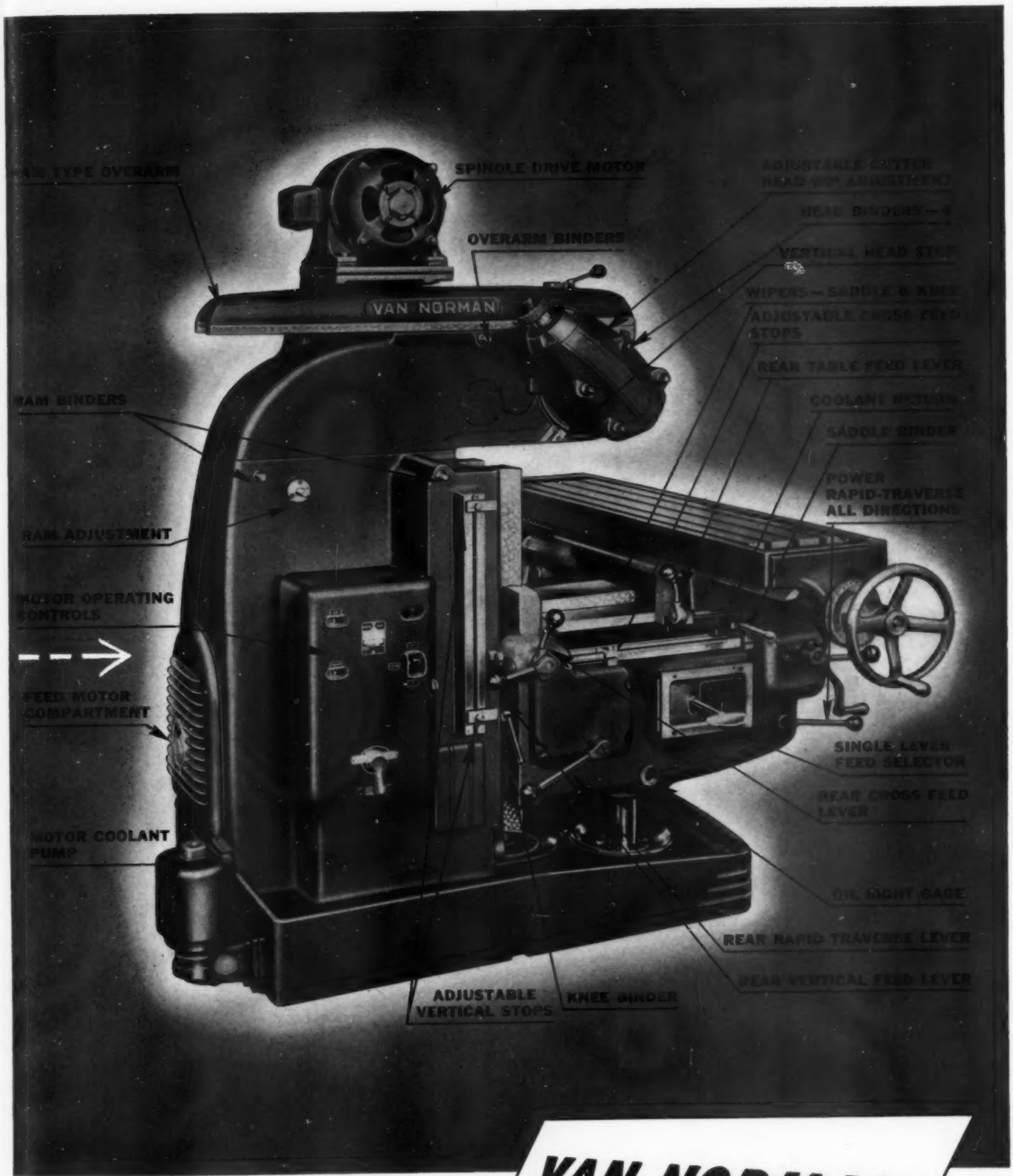
...ON VAN NORMAN RAM-TYPE MILLERS

All controls and adjustments are right at hand . . . quick and easy to use . . . on Van Norman Ram-Type Millers. So operators can turn out better work and more of it, in less time. Operators also find their work lightened and speeded up by front-and-rear controls of power feeds and 6-way rapid traverse . . . single-lever selectors of feeds and speeds . . . and large, glare-proofed dials that are easy to read.

Many jobs can be carried to completion . . . through successive vertical, angular and horizontal cuts on the same machine . . . simply by resetting the cutterhead, instead of taking the time (and the risk of errors) otherwise required to reset the work. In fact, every feature of Van Norman Ram-Type Millers is designed to combine highest accuracy with greatest ease of operation, on toolroom and production jobs.

SPECIFICATIONS:
No. 26 RAM-TYPE MILLER:
Table: 50" x 12"
Range: 28" longitudinal, 12" cross, 18" vertical
18 Speeds: 30 to 1500 rpm
18 Feeds: 3/16" to 32"

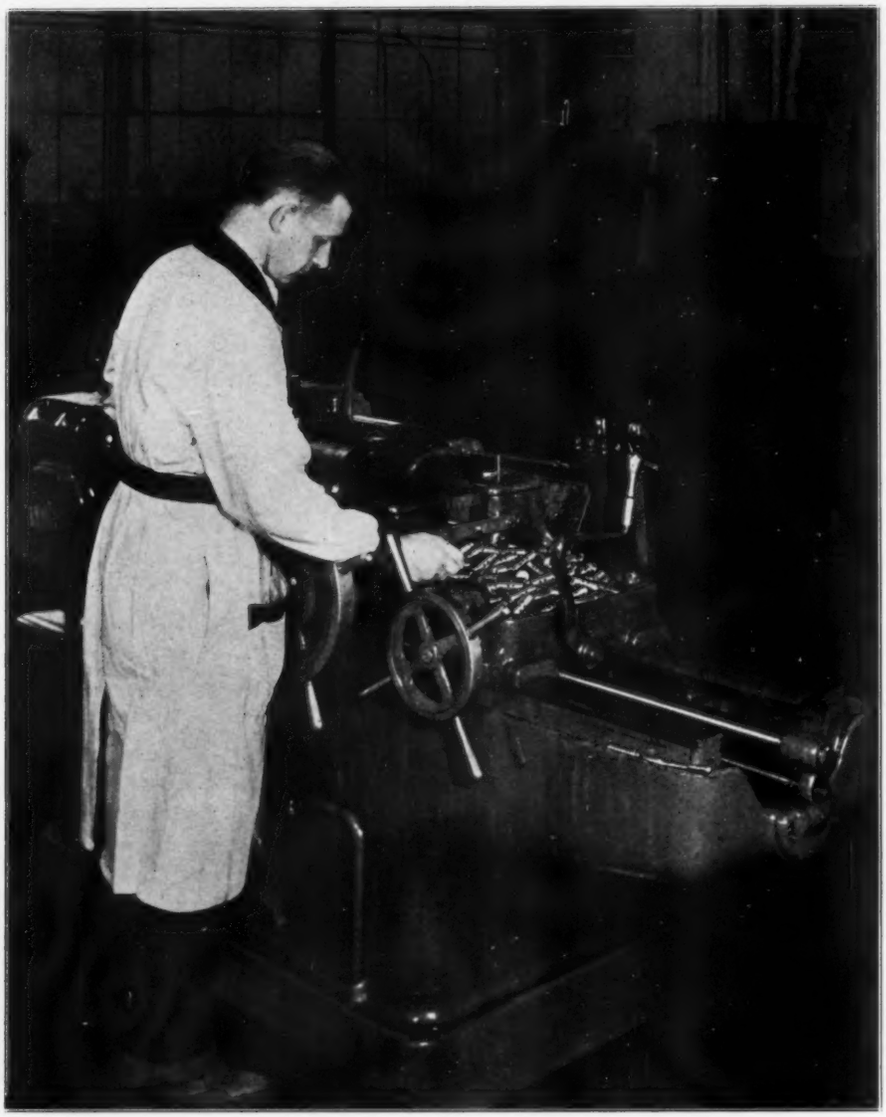
VAN NORMAN MACHINE TOOL CO., SPRINGFIELD,



MASSACHUSETTS

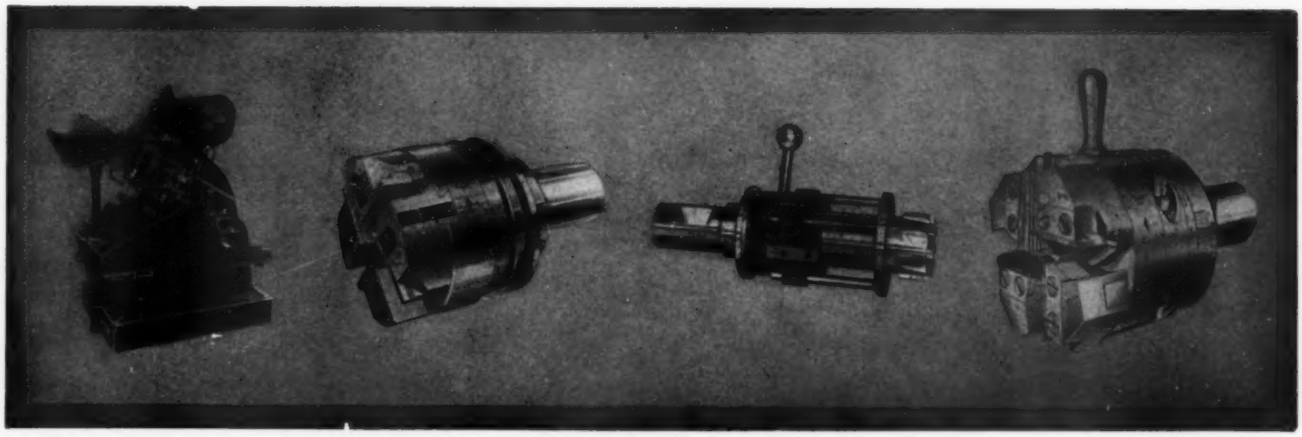
VAN NORMAN
Milling Machines

LANDMACO Threading Machines —Step-Up Defense Production



BE THREADWISE—employ LANDIS

LANDIS
MACHINE COMPANY, Waynesboro Pennsylvania

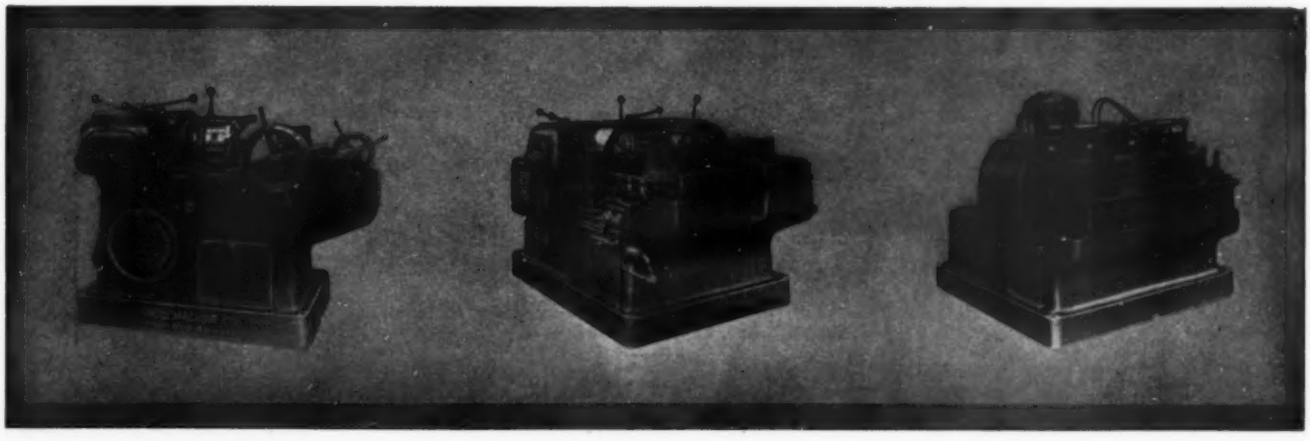


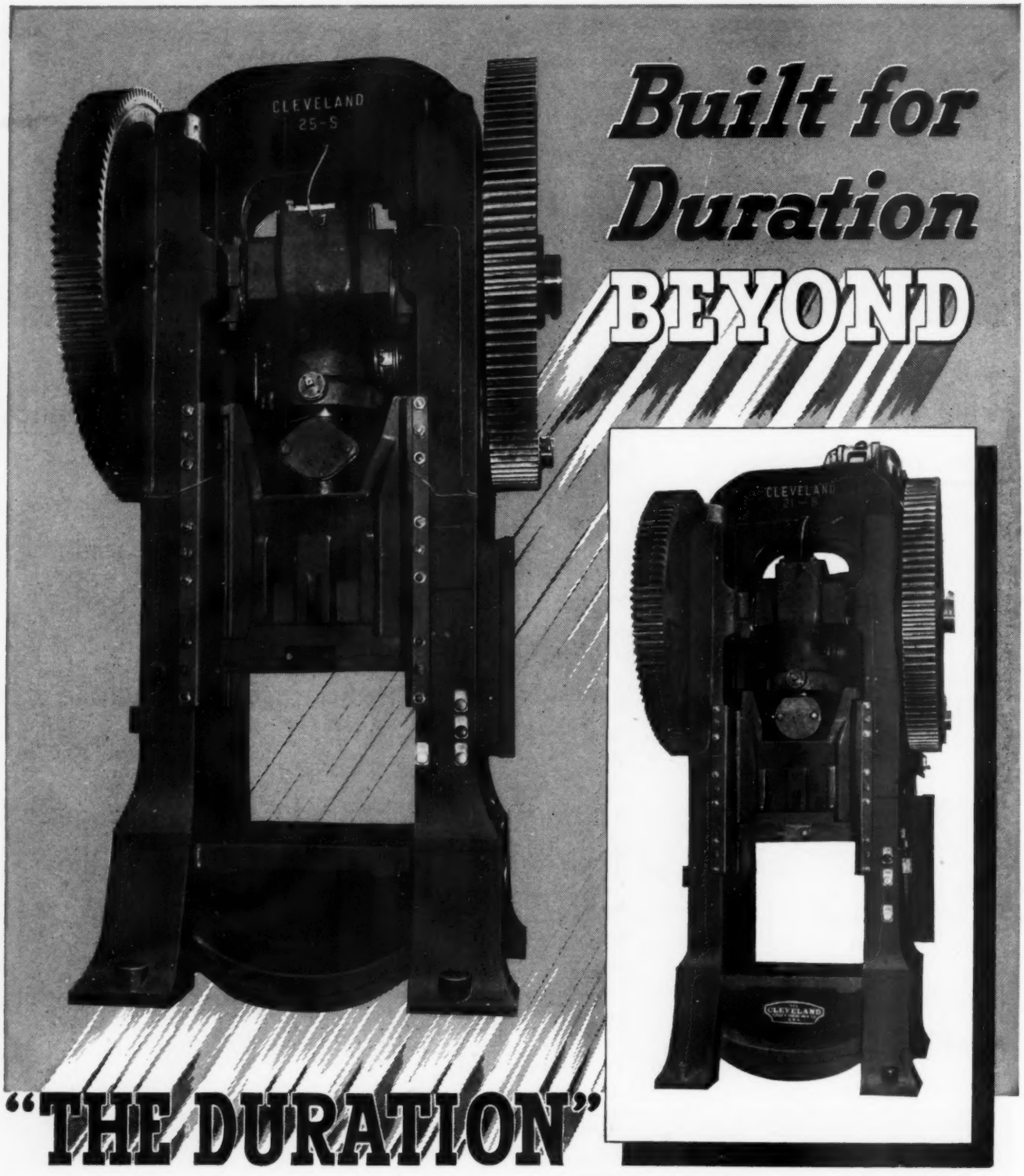
The LANDMACO Threading Machine is setting new Performance Standards everywhere, on Defense Threading Operations.

» LANDMACO Threading Machines are used for threading Cartridge Containers for mortar shells. The threads—5/8" diameter, 18 pitch—must be held within .003" to .005" for concentricity. Furthermore, the threads are cut to close tolerance specifications.

» The LANDMACO Threading Machine produces an average of 335 pieces per hour and 2500 pieces per grind of the chasers. Low threading cost is assured.

Investigate the advantages of employing the LANDMACO Threading Machine for your—National Defense—Thread Cutting Operations.





The ruggedness of Cleveland Power Presses, as typified by these massive, compact Straight Sided Single Crank Presses, denotes their ability not only to stand up under the severe demands of war time production but to continue to serve American Industry efficiently, when it has once again been converted to the task of meeting peace time needs.

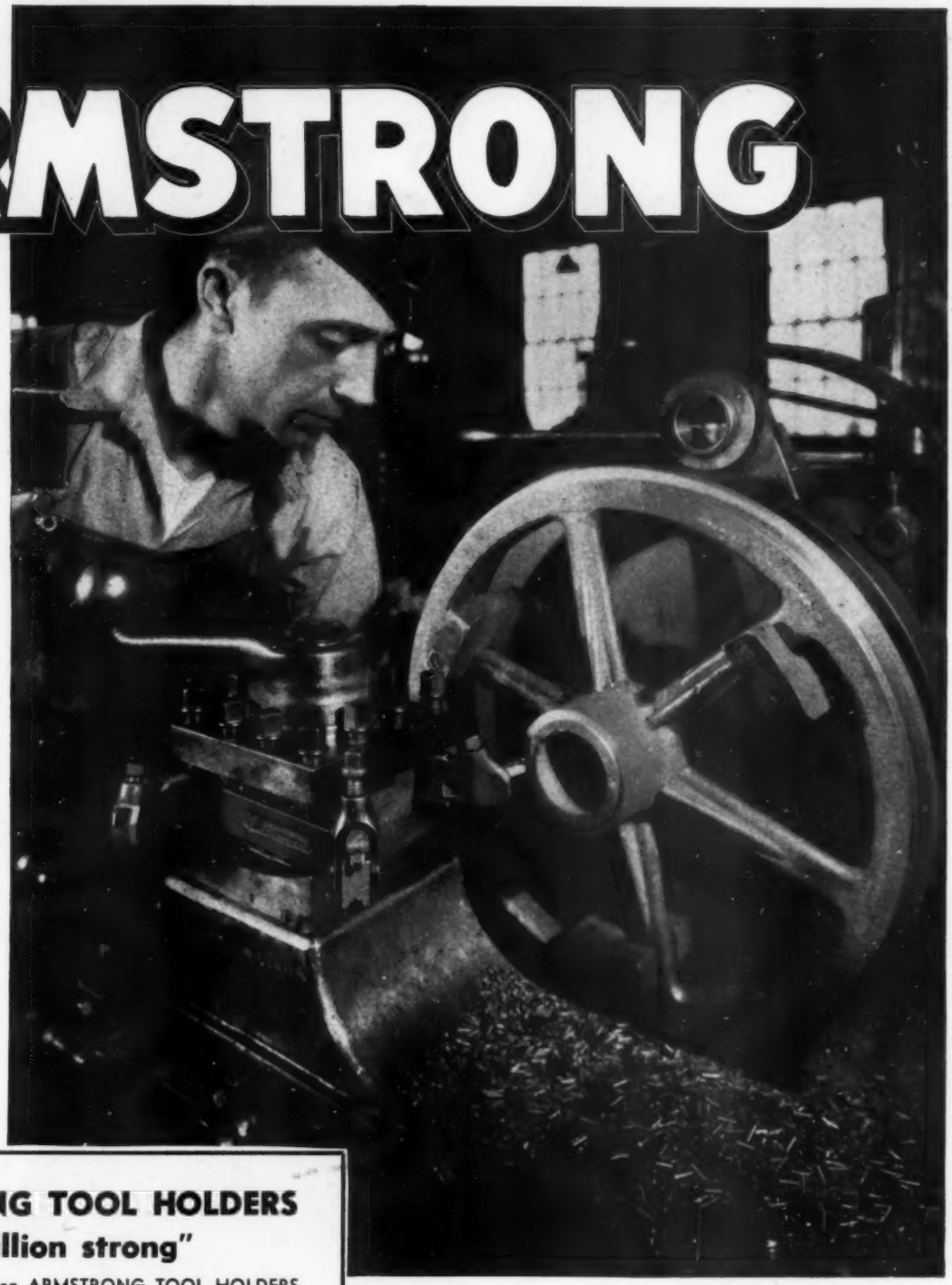
That is why we state that Cleveland Presses are built for duration BEYOND "the duration".

The 25-S has a capacity of 750 tons, a bed area 50"x42" and 10" stroke.

The 21-S has a capacity of 500 tons, a bed area 48"x42" and 14" stroke.

Modern Presses **THE CLEVELAND PUNCH & SHEAR WORKS COMPANY** *Cleveland, Ohio*

ARMSTRONG



ARMSTRONG TOOL HOLDERS

"a million strong"

No nation with a million ARMSTRONG TOOL HOLDERS can be defeated. Because, ARMSTRONG TOOL HOLDERS make the tools that make the implements of modern warfare.

The nation equipped with ARMSTRONG TOOL HOLDERS (and in America more than 96% of the machine shops and tool rooms use them) is always tooled-up—can change over to war work on a moment's notice on any operation on lathes, planers, slotters and shapers, can step-up machine feeds and speeds at will, with safety . . . can draw "experienced" men for non-war industries, schools and repair shops, from all who have ever machined metal are experienced in the use of ARMSTRONG TOOL HOLDERS.

Use ARMSTRONG TOOL HOLDERS wherever possible to speed-up old equipment, to get maximum efficiency from new machine tools, to "Save: All Forging, 70% Grinding and 90% *High Speed Steel.*"

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO, U. S. A.

Eastern Warehouse & Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Send
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Send in the m

Send in the man from Bryant

If any operation, on any product you make, involves internal grinding, it should pay to see the man from Bryant — to tell the man from Bryant all you can about it, to load him down with blueprints, data, specifications and facts in every available form.

Not only has Bryant stepped up production of modern internal grinding equipment (already tripled, and constantly increasing) — but Bryant engineering is also stepping ahead.

Not only does Bryant recognize the duty of American industry to go all-out for defense, but Bryant stands ready today to help far-sighted management to plan low cost production for peace time goods to sell in tomorrow's competitive markets.

So whether your problem is preparedness now or profits tomorrow, let us send in a man from Bryant.

Send in the man from Bryant

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Despite the fact that milling machines had always been produced by "custom-built" methods, Kearney & Trecker Corporation quickly saw the need for, and put into successful practice, mass production systems.

This view of the assembly floor reflects the capacity of our plants — all of them operating 168 hours per week and concentrating upon the volume production of Milwaukee Milling Machines in response to today's peak demand. Many specialized machine tools, developed by Kearney & Trecker engineers, are required to maintain "custom-built" precision and accuracy and to keep step with high production schedules.

Milwaukee MILLING

Producing milling machines by the thousands — to the highest precision standards — is our particular job and we are working at it — twenty-four hours a day, seven days a week.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U. S. A.

KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

As one of our services to industry and the war effort, we have made available a complete course of "visual" lectures on milling practices for the training of milling machine operators. For complete details, write to our industrial training department.

M A C H I N E S • • • •

Today.

American Pacemaker

THE AMERICAN

LATHES

....TIME SAVING

is a MAJOR OBJECTIVE

Speed changes are accurately and instantly made on "American" Pacemaker Lathes.

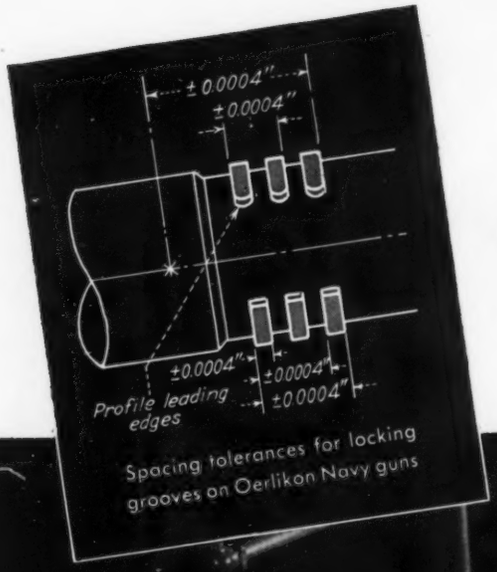
Just two levers provide 27-spindle speeds. Operator does not have to remember speed charts or lever positions—the speed plate is direct reading and right in front of him.

This new operative convenience, plus lots of power and fine lubrication are helping to speed up production—maintain accuracy and increase effective life of "American" Pacemaker Lathes.

Bulletin No. 15 is liberally illustrated to show the Pacemaker's many functional advantages.

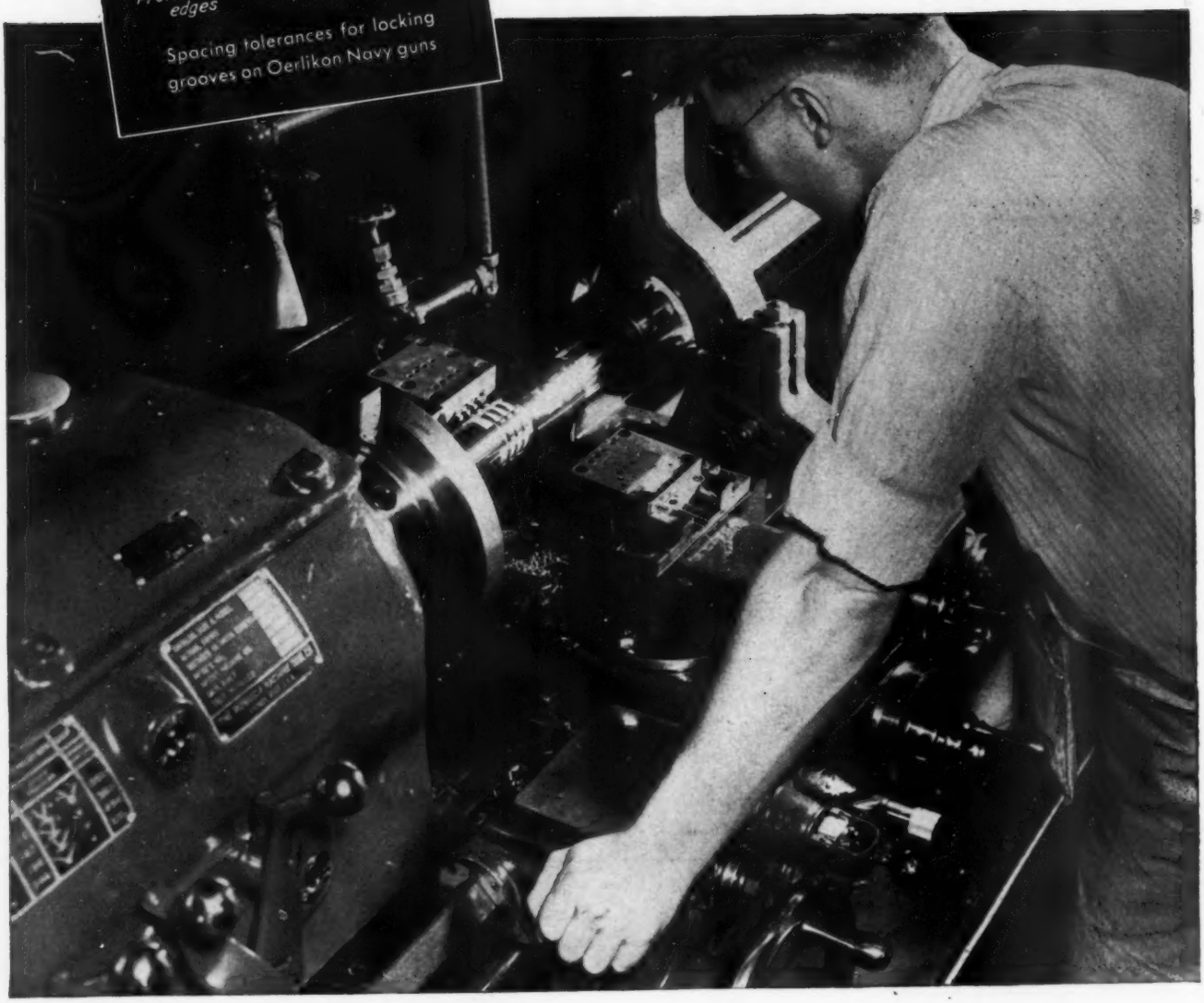
AN TOOL WORKS CO., Cincinnati, U.S.A.

ES • RADIALS • SHAPERS



Spacing tolerances for locking grooves on Oerlikon Navy guns

Formula FOR



THE MONARCH MACHINE TOOL

★

COMPANY • • • SIDNEY • OHIO

ACCURACY ON OERLIKON GUNS

Two interchangeable barrels are required for each Navy Oerlikon gun being built by a large automotive manufacturer. To lock properly in the breech casing, each barrel has three interlocking grooves, which must be turned to accuracy limits of 0.0008″. Actually, the work is produced within 0.0004″.

Steps in the operation consist of:

1. Milling interruptions before grooving to prevent heavy burr being thrown up between grooves. Also, since grooving chips are no longer than the length of the groove, they cannot carry around with the work.

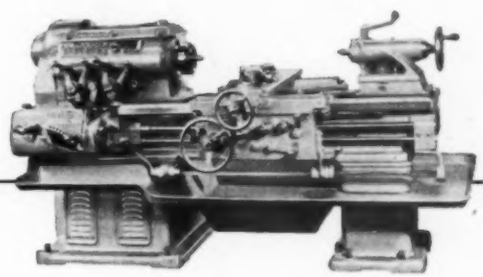
2. Turning grooves on a Monarch 16″ x 78″ Model W Lathe. This is equipped with a special cross slide which mounts front and rear tool blocks and feeds to positive stops. Tools are fitted tightly into blocks, with hardened spacers to maintain accuracy.

Tools are purchased 0.001″ oversize for width and are lapped to half a tenth in the plant toolroom, with extreme care to maintain size and clearance angles, with keen edges free from minute nicks. Tool setting is checked with master gage to a 0.0002″ limit for spacing and cumulative errors.

After tool blocks and positive stops are set, the work becomes almost completely automatic on this type of Monarch Lathe. This is the same basic design which is used extensively in the automobile industry for piston grooving, and that has proved its worth for so many years in its accuracy and unfailing performance.

Again, we point out that regardless of increase in the production of Monarch Lathes for war implement use, we tolerate no letdown in the quality which has earned Monarch's reputation.

Whether the job requires power, speed, accuracy or stability, Monarch Lathes are producing for OFFENSE.



MONARCH LATHES

COVER THE TURNING FIELD

"PUT IT ON THE BLANCHARD"

+.0003"-.0001"
WITH VERY FINE FINISH

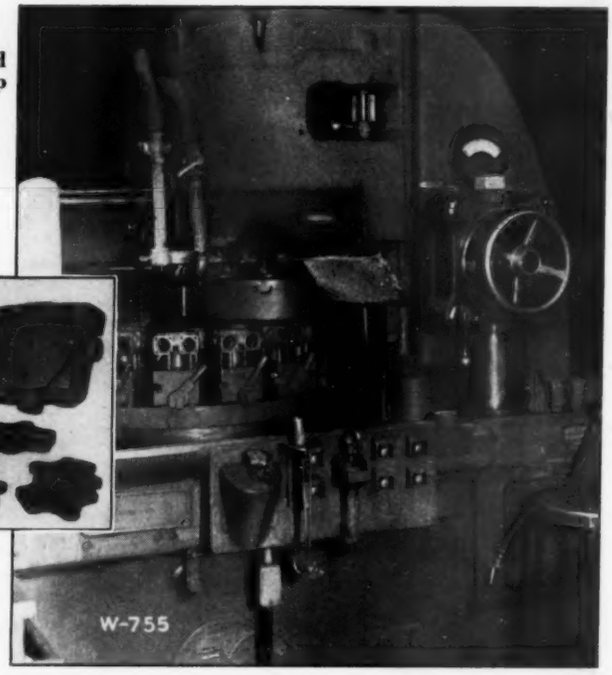
BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*

No. 18 Blanchard grinding oil pump bodies.



Group of oil pump body parts — all ground on No. 18 Blanchard.

PRODUCTION INCREASED 71 PER CENT

BOTH roughing and finishing are done by the same No. 18 Grinder on these oil burner pump parts. First ground from the rough, then normalized and ground again, the parts are then ready for boring and drilling, locating from the flat Blanchard Ground surfaces. After all machining is done the parts are finish ground on the Blanchard to limits of +.0003"-.0001" and to a very fine finish. The pump body must have its end square with a finished bore. Twelve are held at one time on fixtures mounted on one base plate, and magnetically held. It only takes a few minutes to remove the group of fixtures, leaving the chuck clear for other work.

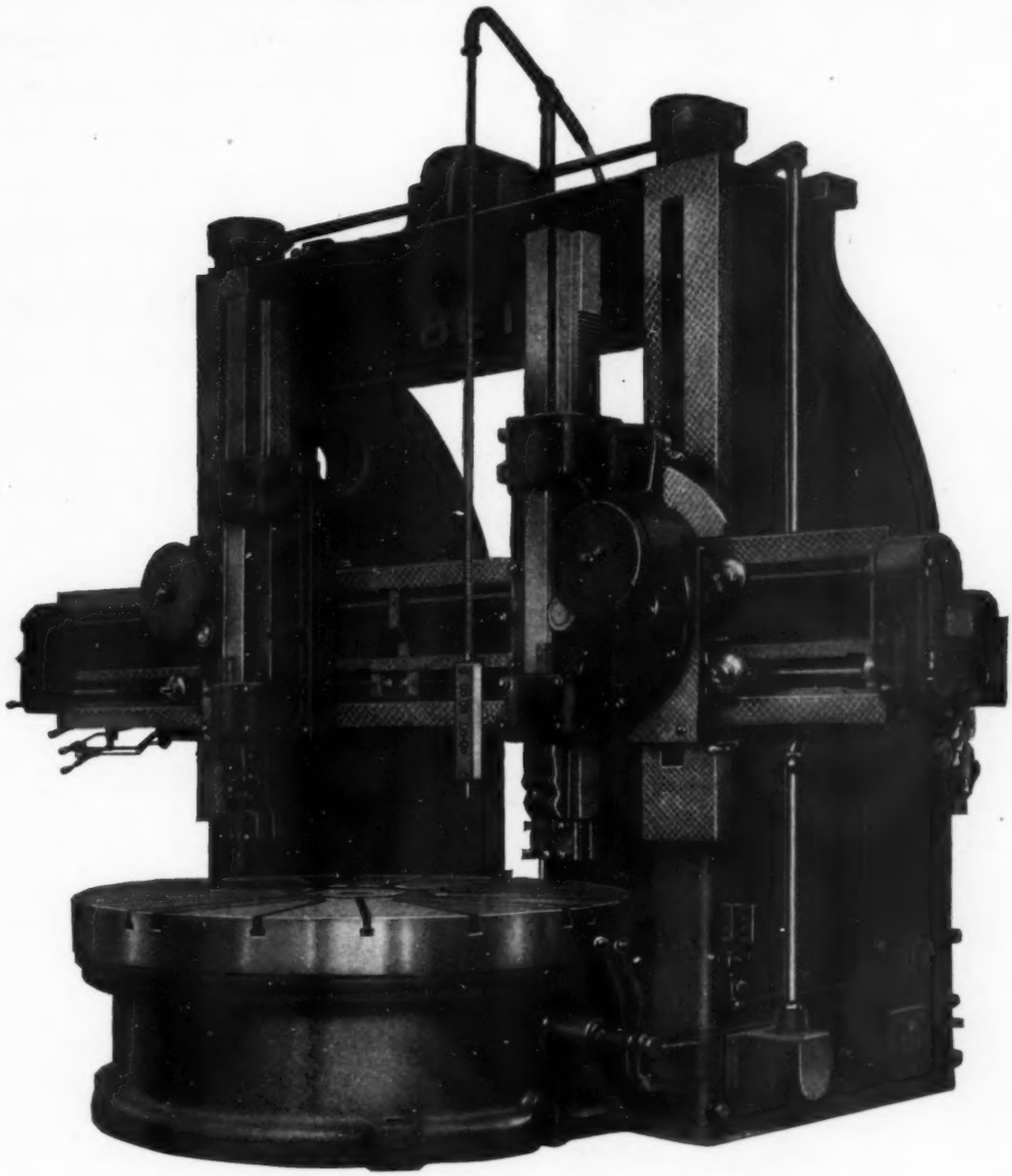
Blanchard cylinder grinding wheels, manufactured by the Blanchard Machine Company, are used on this job. This was another reason for being able to increase the production from 28 to 48 pieces per hour.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

BETTS

A NAME UNIVERSALLY ACCEPTED AS THE LEADER FOR FAST, ECONOMICAL AND ACCURATE PRODUCTION



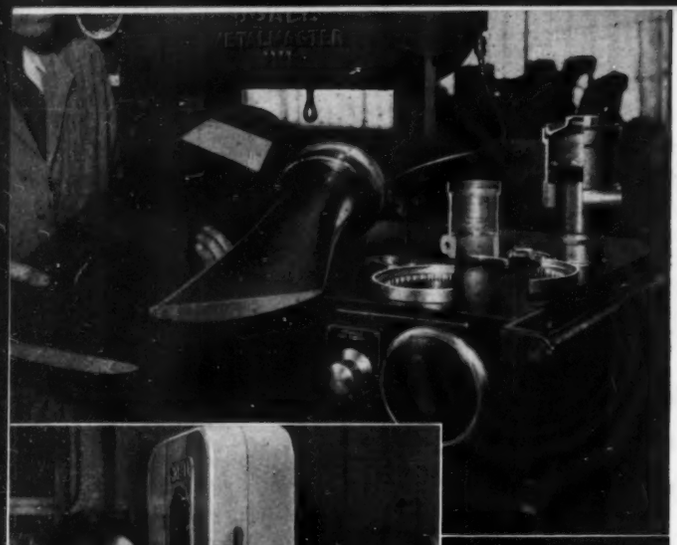
Ask any of the defense contractors what they think of

BETTS BORING MILLS

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

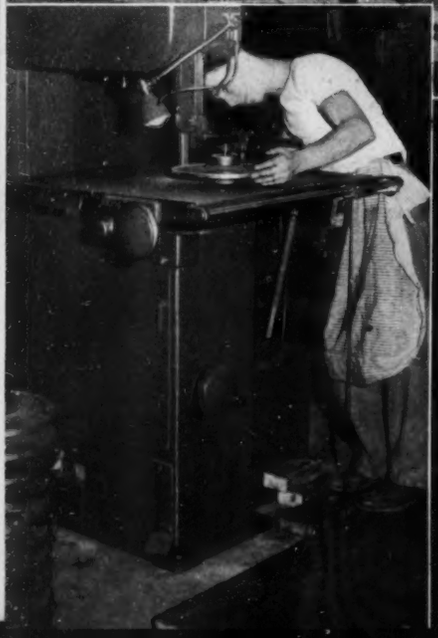
CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER, NEW YORK



Variable pitch Propeller Blades made on the DoAll with great savings of time.

Special Parts made on the DoAll in a fraction of former time.



Sector Gears cut in 5 minutes each. Formerly took 30 minutes each on a miller.

Disc Rims polished on the DoAll in 2 minutes each. Formerly took 1 hour each by hand.

DoAll

• No, we don't need any more time. We have as much time as our enemies, but we do need *more production per hour,* and that's where the DoAll Contour Machine is doing such a magnificent job — knocking former shape cutting records into a cocked hat!

ON THE JOB 24 HOURS A DAY

In every modern plant from coast to coast, wherever war orders are going through on direct or sub contract, you'll find the DoAll doing all kinds of special production cutting, relieving $5,000 to $50,000 machine tools for other work.

★ ★ ★

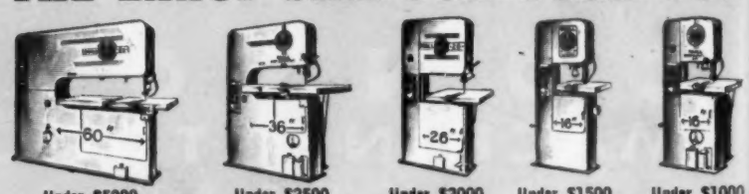
Don't care what the metal or alloy is—there's a DoAll band to do the job not only quicker, but smoother and better.

Fastest Precision Method to Remove Metal

For external and internal sawing of all metals and alloys (flats, blocks, bars, sheets or tubing)—for making special tools and parts without dies—for regular production work—investigate the DoAll, wonder machine of our day. There are 5 models with throat capacities ranging from 16" to 60", priced from $1000 to $5000, including motors.

Ask to have a factory-trained man call and show you how much time and energy a DoAll can save in your plant

THE EXACT SIZE FOR YOUR JOB



Under $5000 | Under $2500 | Under $2000 | Under $1500 | Under $1000

All Models with Motors

PRODUCTION
TURNS MAN HOURS INTO MINUTES

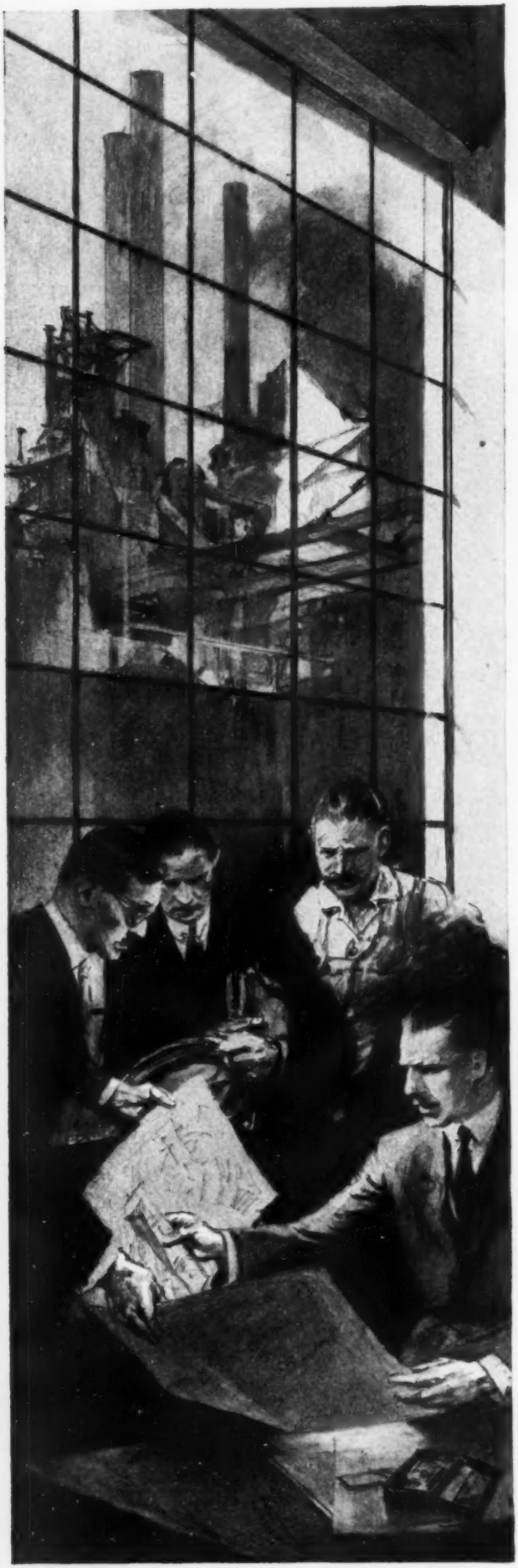
Armor Plate ½" thick cut on the DoAll. Fomer method was torch and grinding off flash.

CONTINENTAL MACHINES, INC.

1310 W. Washington Ave., Minneapolis, Minn.

Associated with the DoAll Company, DesPlaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

NEW—Send for helpful book "DoAll on Production" for a bird's-eye view of real accomplishment!



THE KNOW HOW

● "Know How" to seasoned men of industry means the combination of skill and resourcefulness that comes from experience. It implies the ability to do a job with the tools and materials at hand. It assumes that the job will be well done and on time.

Never before in our Country's History has the American "Know How" been so challenged. Never has such a challenge been so answered.

Building ships, guns, planes and the huge machines on which they are made in mass production takes "Know How" and plenty of it. It also takes "Know Who" and "Know Where". Who is the best equipped to make a certain part? Where is the plant located? How many can they turn out in the time allowed? In the answer to these questions is the answer to the challenge which war has hurled at American industry. In it is also the explanation of the fact that our 1942 production will be nearly ten times as great as in 1939.

There are more than 100 other plants contributing to this ever-growing torrent of production for war. Our job has been to utilize their facilities to the utmost and to co-ordinate them with our own. The one thing that has done most to make all this possible is the Great American "Know How". It is what our enemies did not count on; cannot understand. It is what will equip America's armies to win the war, the peace, and all that follows.

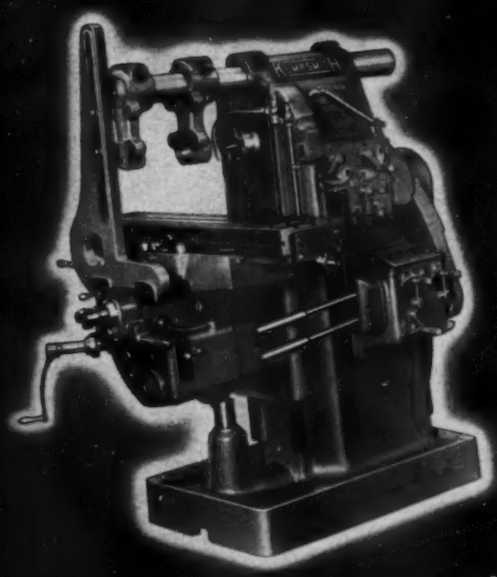
GENERAL MACHINERY
CORPORATION
HAMILTON, OHIO

THE NILES TOOL WORKS CO.
THE HOOVEN, OWENS, RENTSCHLER CO.
GENERAL MACHINERY ORDNANCE CORPORATION

OK! WPB and INDUSTRY

HERE'S MORE *Production Now!*

Industry's battle for more production now is being won today largely because it was won *54 years ago!* The super-quality standards maintained by KEMPSMITH for more than half a century, are now helping industry to answer, successfully, war-production demands on a 168-hour week basis (420% x a 40-hour week EVERY week) . . . because KEMPSMITH Milling Machines are engineered and built to deliver that sort of emergency service. Sturdier . . . capable of heavier cuts without deflection or vibration . . . 18 speeds and feeds . . . KEMPSMITHS can be depended upon for more PRODUCTION NOW!



KEMPSMITH TYPE "G" MILLER

. . . . "brother" of the famous KEMPSMITH MAXIMILLER . . . economical in first cost; an efficient, precision miller for tool-room and light production work.

KEMPSMITH MAXIMILLER

. . . built to speed up production on 3-shift schedules . . . a rugged high-speed miller, with reliable accuracy and extra power for heavy, continuous cuts on long production runs.

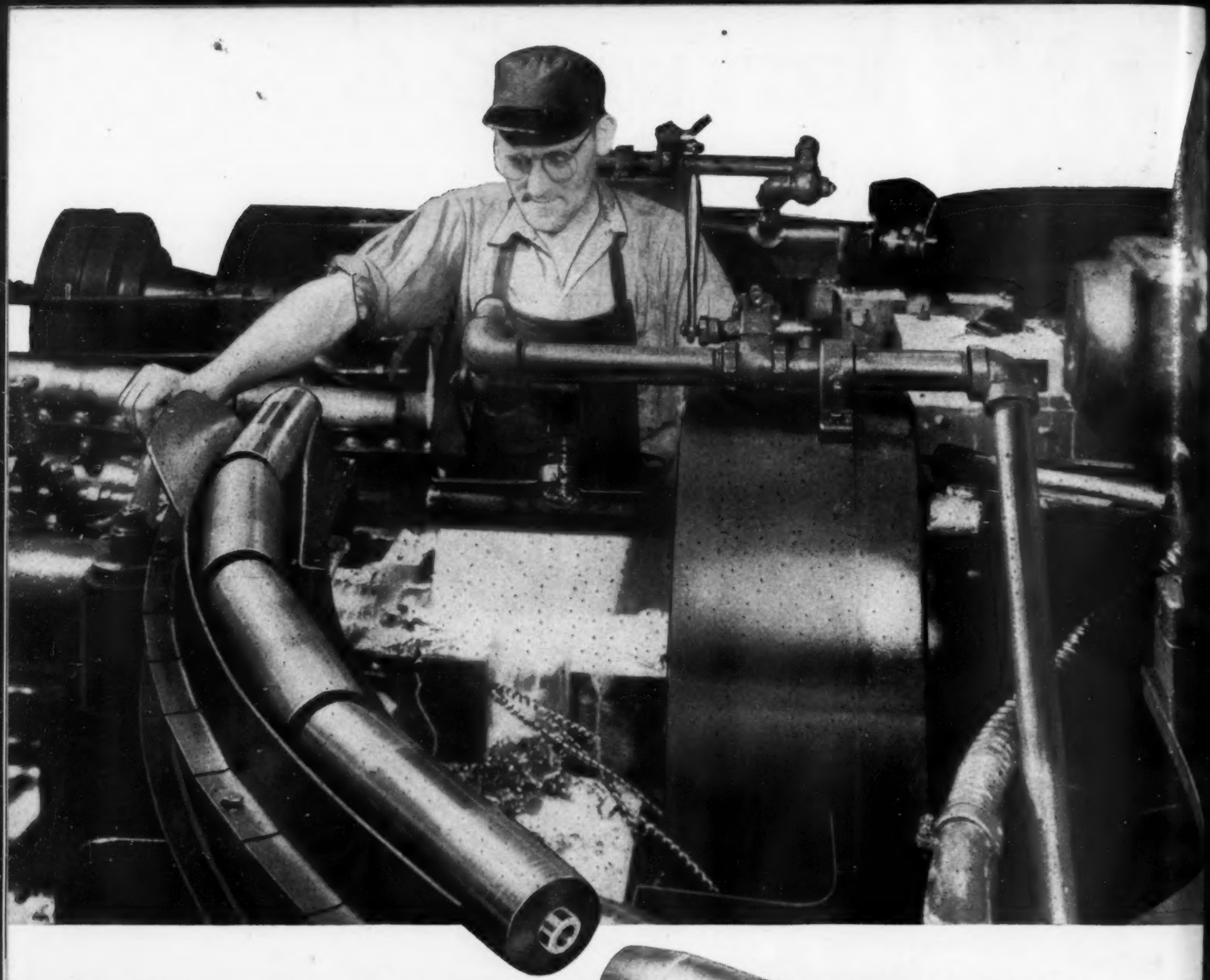
PRECISION

MILLING MACHINERY

Experience SINCE 1888

KEMPSMITH MACHINE CO.

MILWAUKEE • WISCONSIN



SHORT CUTS TO VICTORY!

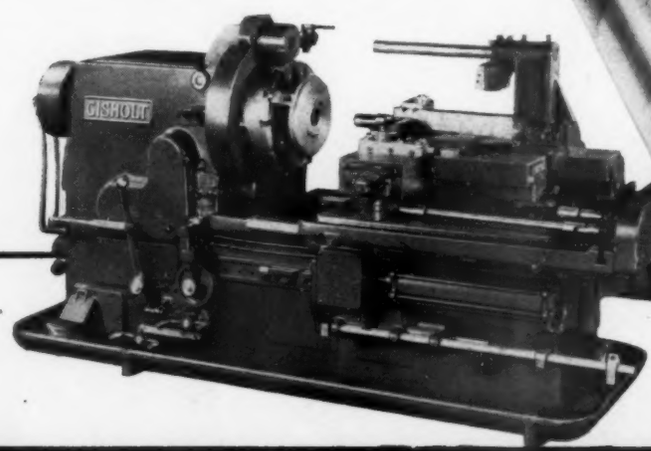
● Faster and faster flows the stream of war production. Faster and faster come the materials from American arsenals and industrial plants.

In the forefront of the production battle today are such time-saving, man-saving machine tools as the Gisholt Simplimatic . . . putting to vital use the peace-time lessons of mass production for millions.

Here, with but little training, one man can out-produce more than two, three, or even four skilled operators on hand-operated, non-automatic machines. Here is high-speed production that short-cuts the road to Victory.

Gisholt Machine Company, 1201 East Washington Avenue, Madison, Wisconsin

THE GISHOLT SIMPLIMATIC *is entirely automatic in operation, designed for multiple cutting, with the ability to maintain accuracy at high-cutting speeds. Extremely simple to operate, it can be tooled to handle a wide variety of cylindrical parts.*



GISHOLT

LOOK AHEAD . . . KEEP AHEAD . . .
WITH
GISHOLT IMPROVEMENTS
IN METAL TURNING

TURRET LATHES · AUTOMATIC LATHES · BALANCING MACHINES

UNION

For uniformly accurate results on every job, for uninterrupted production, for tool economy – choose Union Tools! Designed and built for the longest service on the toughest jobs, they are doing their part in the Victory program by keeping production high and tool costs low on munitions and aircraft jobs that demand the ultimate in precision.

Union Butterfield Card

DIVISIONS OF THE UNION TWIST DRILL CO.

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
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New York: 61 Reade St.
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CARD

QUALITY TAPS PLUS COMPLETE SERVICE

For more and better threads from every tap, stick to the Card combination—superior taps plus intelligent engineering service! Let us help you choose the correct tap for most efficient performance in any metal or plastic—and take advantage of Card Service to get the most threads and the highest accuracy from every Card Tap.

S. W. CARD MFG. CO.
MANSFIELD, MASS.

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San Francisco · 121 Second St.
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Seattle · 568 First Ave., South

Union Butt

DIVISIONS OF THE UNION

REAMERS by

Butterfield

Choose these better reamers for better results . . . accuracy that checks with the most exacting aircraft and ordnance specifications, performance that insures continuous operation to meet today's demands for more and more output, and tool economy that is of major importance in these days of scarcities and priorities.

» Specify "REAMERS By BUTTERFIELD" when you want the maximum in small tool performance.

tterfield Card

BUTTERFIELD DIVISION
DERBY LINE, VT. ROCK ISLAND, QUE.

STORES: New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal. W. Reynolds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth St. Toronto, 208 King St., West. Montreal, 111 St. Paul St., West. Winnipeg, 403 Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain — Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

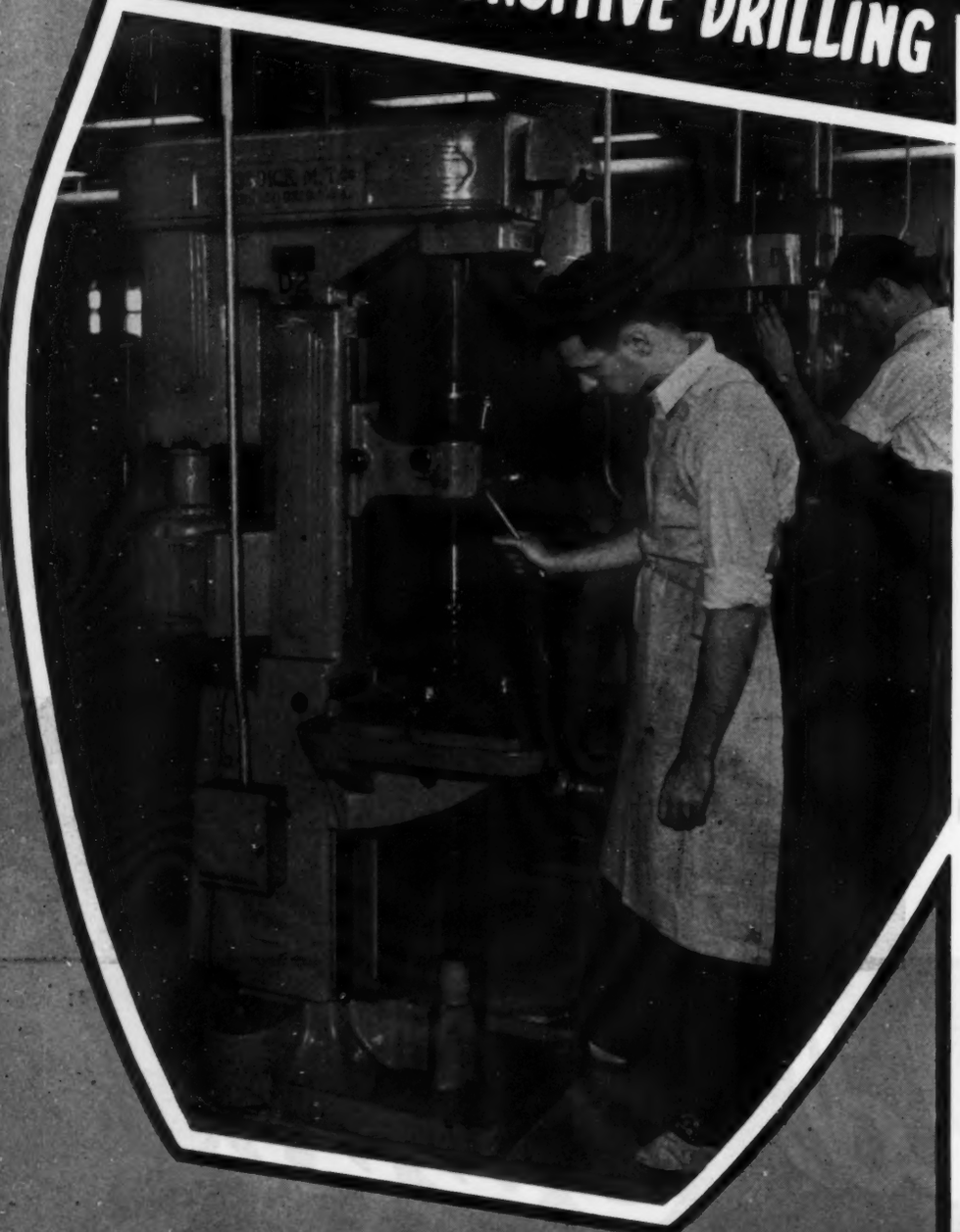
ON **TWIST DRILL COMPANY**

WHERE THERE'S SMALL HOLE DRILLING . . .

There's

FOSDICK

H.S. SENSITIVE DRILLING



In the hundreds of shops with war contracts, in the converted Auto Plants now doing war work exclusively and in airplane plants from coast to coast you will find Fosdick High Speed Sensitive Drills performing a host of operations from drilling to tapping holes up to 1¼" diameter.

Shown is a Fosdick H.S. Sensitive Drill in a converted automobile plant. A comparatively simple drilling operation is being handled quickly—efficiently—at low cost.

Ample feed and speed changes are self contained—all revolving shafts are mounted on anti-friction bearings — gears slide on splined shafts—so that in addition to a versatile machine, capable of a wide range of work, you have a sturdy, well balanced construction equal to the heavy 24 hour production schedules required on urgent war work.

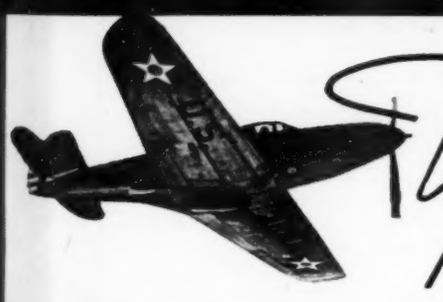
On the basis of its wide acceptance, for holes up to 1¼", you can depend upon Fosdick H.S. Sensitive Drills for your work.

Fosdick Drill Bulletin H.S.A. gives full details on range of 6 to 18 speeds—how it is furnished in any number of spindles up to 6 and on combinations of power or hand feed spindles. Write for a copy today.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI . . . OHIO

WHERE *Precision* IS PRICELESS



YES, it's a comparatively small part —*a cylinder hold down stud*—only one of many threaded hardened pieces that go to make up the powerful engines of today's fighting planes . . . small but vital parts that must be *precision-machined* if they are to endure the stress that's unavoidable in modern airplane engines . . . this stud (with threads on both ends, tapered and straight, *precision ground* from the solid after heat treat) is typical of thousands of hardened parts being threaded on a production basis day and night for the aircraft industry . . . *on Ex-Cell-O thread grinding machines* . . . to the highest commercial standards of accuracy in size and finish.

EX-CELL-O CORPORATION • DETROIT, MICH.

The modern precision thread grinder is an Ex-Cell-O accomplishment, introduced by Ex-Cell-O to American industry in 1935. There are nine styles of Ex-Cell-O Precision Thread Grinding Machines, covering an extremely wide range of work for both external and internal threads. Below is Ex-Cell-O Style 33 Automatic (used for production of precision threaded hardened stud shown above).

XLO

EX-CELL-O *means* PRECISION

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS

To Finish The Job Quicker . . .

KEEP YOUR GRINDERS OPERATING NIGHT AND DAY

A chuck body being ground on a Landis 6" x 18" Type C Plain Grinder. Production averages about 275 pieces per hour. Accuracy is held within a limit of .0005" while .0015" stock is removed during the finishing operation.

Help keep our weapons rolling by keeping your grinding wheels turning night and day. Keep your grinding wheels turning by installing grinding machines that are famous for low maintenance and continuous service.

Three years ago several Landis 6" Type C Plain Grinders were installed in the plant of a chuck manufacturer. There they are kept in operation 147 hours a week. Concerning their performance the plant manager recently stated that "one of the outstanding features of these machines is the fact that maintenance expense has been zero."

Night and day these grinders are giving their owners constant, low cost service. And what they are doing in this plant, they can do in yours.

Unusual Performance As Usual

PRECISION LANDIS GRINDERS

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.

MICROSPHERE WHEEL SPINDLE BEARINGS

MULTI-SPEED HYDRAULIC TABLE TRAVERSE

HYDRAULIC STRAIGHT INFEED

396

HARDINGE
HIGH SPEED
PRECISION LATHE

TIME is a factor . . .

HARDINGE
HIGH SPEED PRECISION
SECOND OPERATION MACHINE

HARDINGE machines

HARDINGE
HIGH SPEED PRECISION
TOOL-ROOM LATHE

Produce PRECISION work

HARDINGE
HIGH SPEED PRECISION
MILLING MACHINE

RAPIDLY!

HARDINGE Precision Machine Tools with preloaded ball bearing spindle construction *combine* high speed and extreme accuracy. This, and the simplicity of operation, enables relatively unskilled operators to rapidly produce parts to the necessary close limits without expensive tooling.

HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

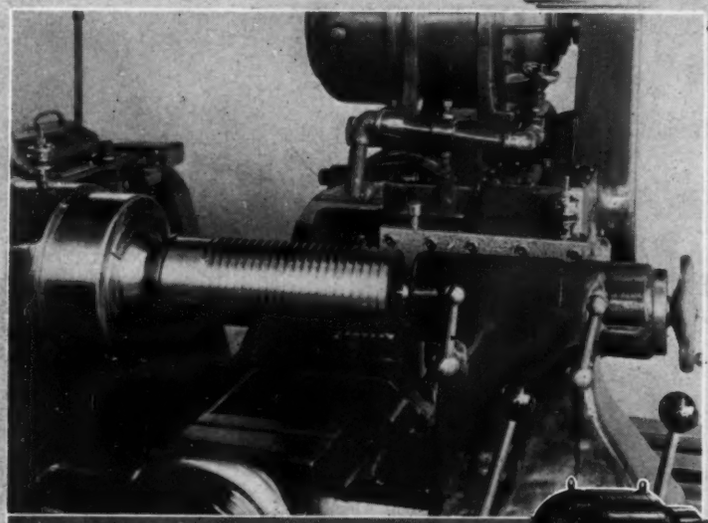
PRECISION ON HEAVY WORK

The LEES-BRADNER

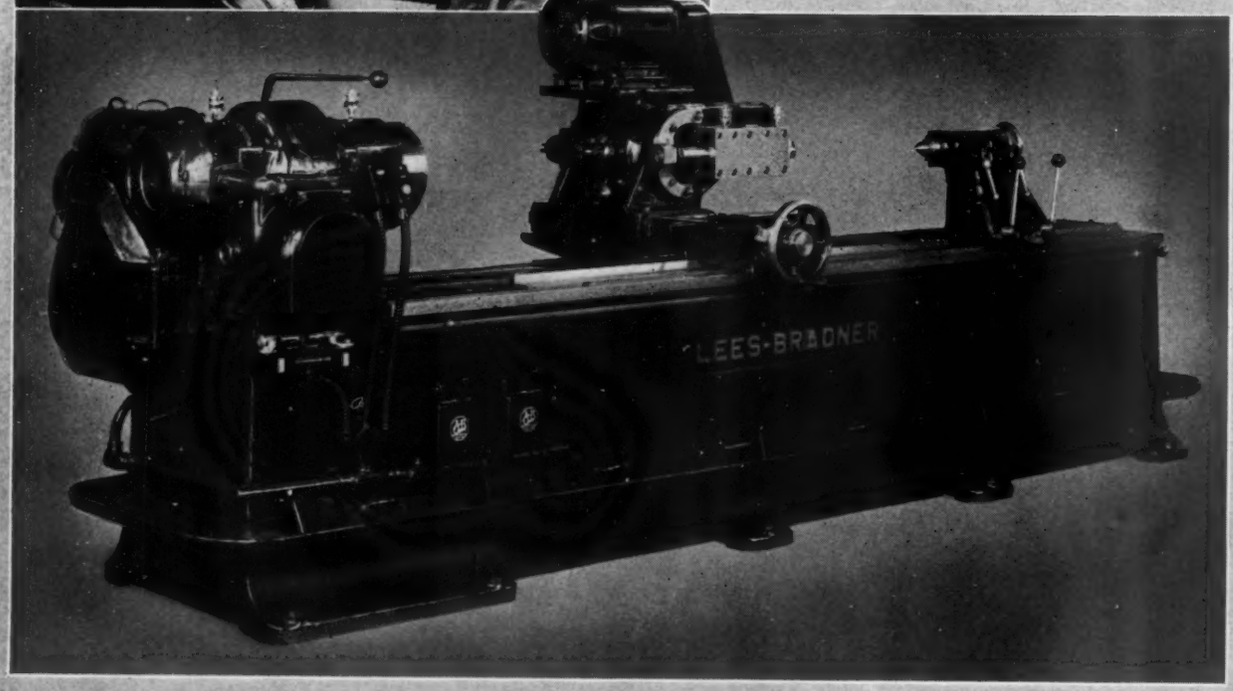
Model HT

THREAD MILLER

The Model HT Lees-Bradner Thread Miller milling a large diameter press brake screw in the plant of a prominent Shear, Press Brake, and Shaper Builder.



★ This sturdy, heavy-duty thread milling machine is providing extremely close tolerances and surprisingly rapid production in numerous plants. The HT model has a diameter capacity of 12", is built in several lengths, and will handle work up to 2½" circular pitch.



The LEES-BRADNER Company

CLEVELAND, OHIO, U.S.A.

*RESULTS from planned production on a battery of... P&J AUTOMATICS

***MAXIMUM PRODUCTION OF LARGE RAILROAD TYPE TIMKEN BEARINGS AT MINIMUM COST . . .**

The machine on this job is a P&J 7-D Automatic Chucking and Turning Machine, tooled by P&J engineers. Carbide tipped cutters are used except for rounding corners.

Note the long cylindrical pilot bars which engage in guide bushings on the turret and thereby maintain turret tools in perfect alignment—a feature of unusual importance in order to assure the maximum in accuracy and speed on heavy work such as is involved on this job.

The modern engineering behind P&J Automatics assures the means for producing difficult operations such as represented here on a high production scale. While output rate cannot be given in specific terms, production and accuracy are exceedingly high while costs are remarkably low.

Operating convenience of P&J Automatics is such that one man can usually handle a battery of these machines thereby conserving skilled man power for other important productive work.

DETAILS OF JOB —

PART: Double Cones for Timken Bearings
Material: Forged Steel
Machine: 7-D Automatic
Machining Operations:

FIRST OPERATION

1st T.F. — Rough bore; turn large O.D. or center rib also small O.D. rib and raceway with 3 or 4 tools; rough face from cross slide.

2nd T.F. — Finish bore and radius; finish face from cross slide.

SECOND OPERATION

1st T.F. — Rough O.D. small rib, also rough raceway with 3 or 4 tools; rough face from cross slide.

2nd T.F.—Rough large rib undercut; rough form O.D. with circular tool from cross slide.

3rd T.F.—Finish undercut center rib and radius bore; finish form and finish face from cross slide.

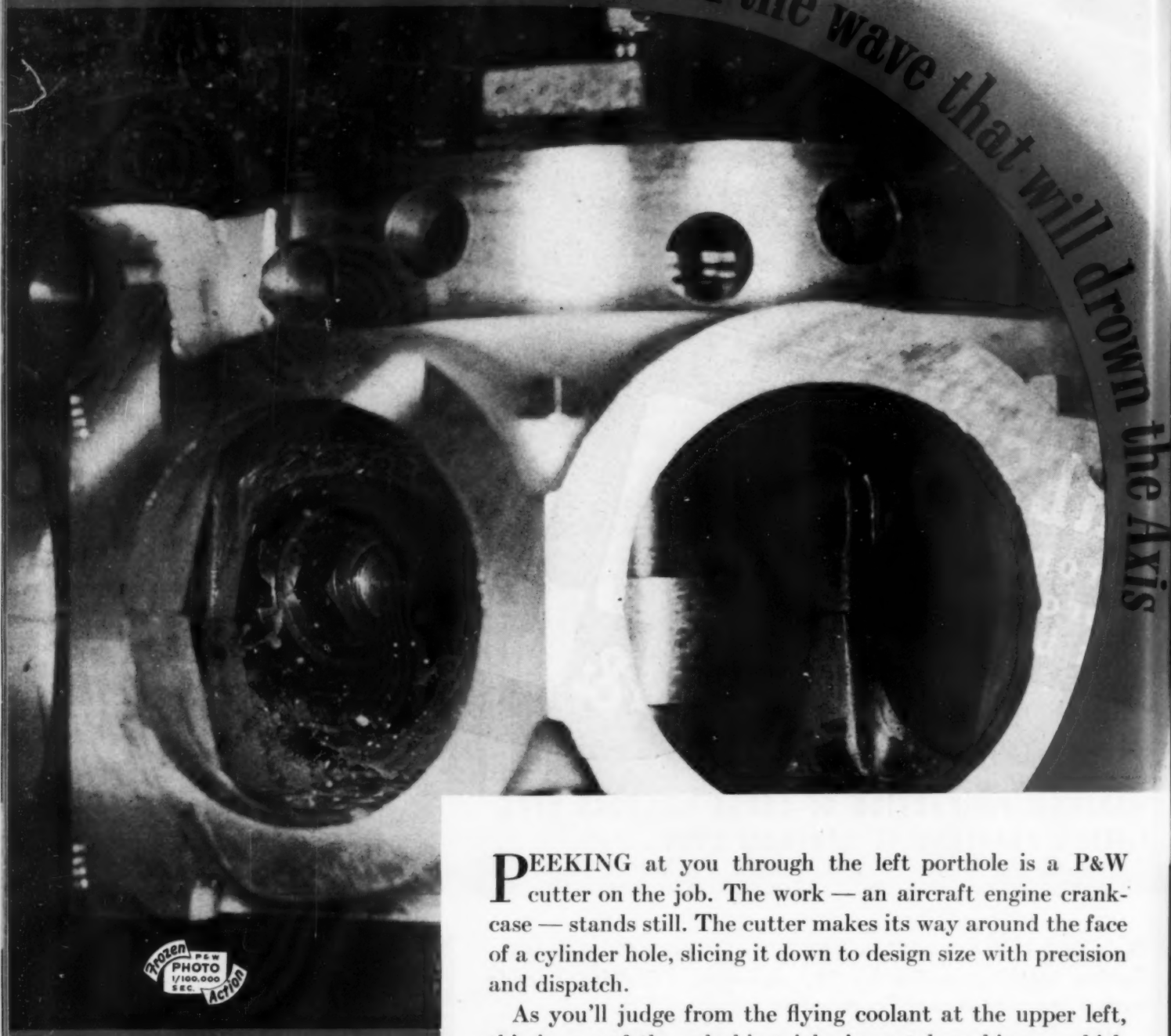
THIRD OPERATION

1st T.F. — Undercut center rib.

POTTER & JOHNSTON MACHINE CO.

PAWTUCKET, RHODE ISLAND

ONE SMALL SPLASH of the wave that will drown the Axis



P&W Photo—Unretouched

PEEKING at you through the left porthole is a P&W cutter on the job. The work — an aircraft engine crankcase — stands still. The cutter makes its way around the face of a cylinder hole, slicing it down to design size with precision and dispatch.

As you'll judge from the flying coolant at the upper left, this is one of the splashiest jobs in metal working — which indicates the cutting speed and power of this P&W cutting tool.

Wherever *accurate* cutting is vital in American industry, P&W cutters, taps, dies, reamers, and end mills now are pounding out production 24 hours a day . . . hastening the time when we'll return a solid sock in the face for that slinking stab in the back.

Don't spare the pressure. Your P&W tools can take it.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

MORRIS MOR-SPEED *Radial*

The operator of a Morris Mor-Speed Radial has complete control of all functions of the machine including arm and column controls, from his normal operating position—no walking around or bending over to change feeds or speeds or to set column clamp.

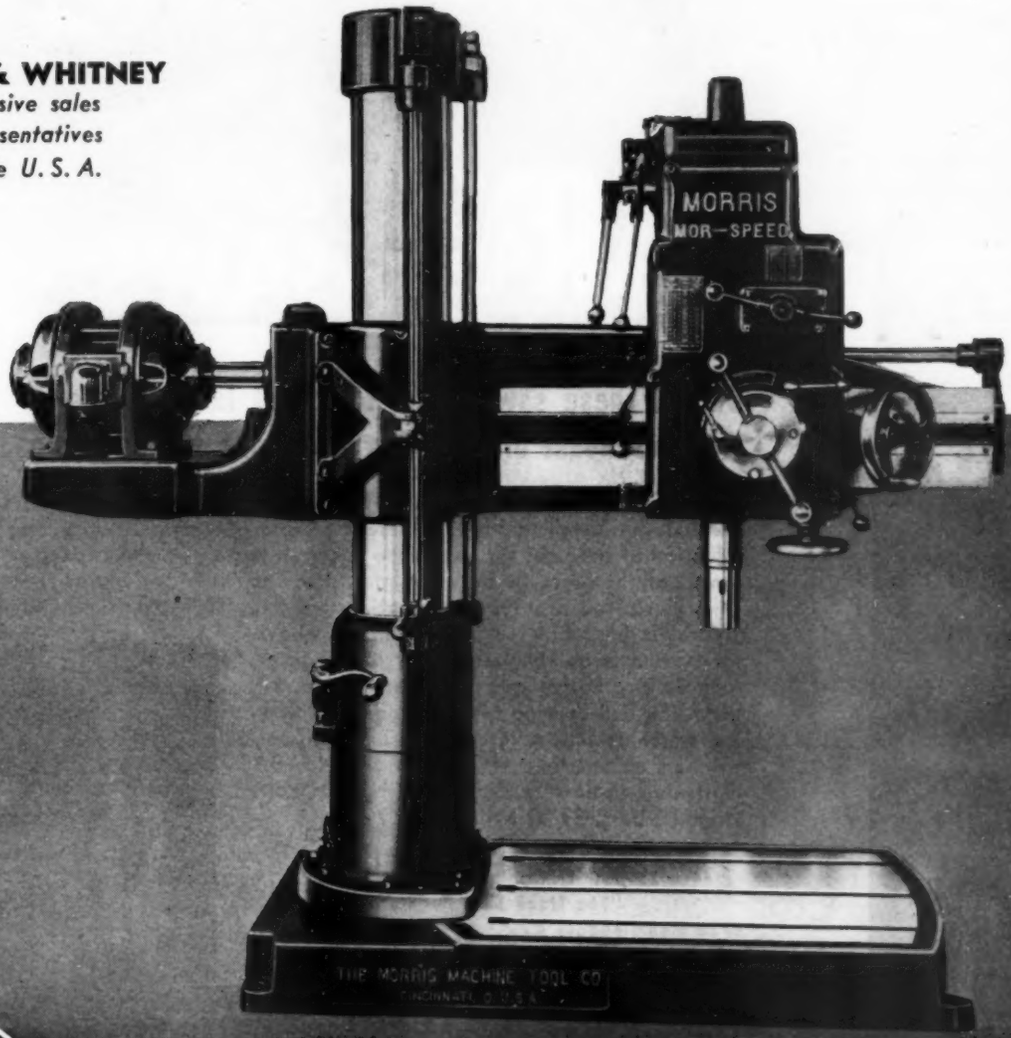
This is only one of many time and labor saving features of the Morris Mor-Speed Radial that make for greater production, ease of operation and lower costs.

Now being used in many of the plants producing war materials — in shipyards — in battleship machine shops—in railroad shops, and in machine tool shops.

If yours is a Radial Drill operation, consult a Morris Machine Tool Co. representative, or write for bulletin.

provides complete control from NATURAL OPERATING POSITION.

PRATT & WHITNEY
exclusive sales representatives in the U. S. A.

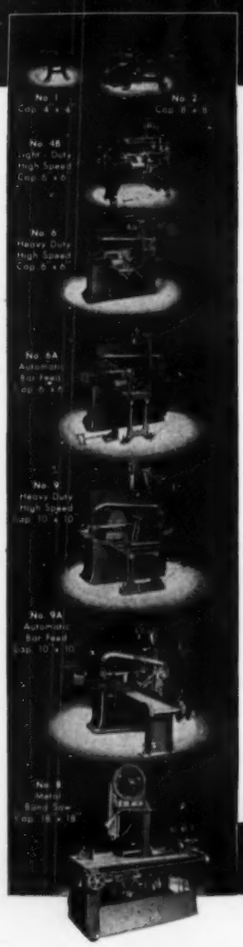


Builders of MOR-SPEED *Radials*

The MORRIS *Machine Tool Co.*

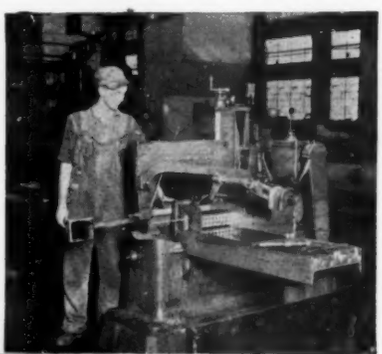
CINCINNATI, OHIO

MARVEL SAWS



One of these saws "paid for itself in 3 months on two storehouse orders" in a prominent Railroad Shop.

Innumerable locomotive shops have modernized their cutting-off methods by installing MARVEL Hack Sawing Machines. While the selection of the saws for each shop depends largely on the capacity range of the work to be encountered in the individual shop, the saws illustrated are typical selections: A No. 18 MARVEL Giant Hydraulic (capacity 18" x 18") shown above for cutting large size bars, billets or forgings, such as locomotive axle stock; and a No. 9A MARVEL Ball Bearing High Speed Hack Sawing Machine (capacity 10" x 10") equipped with an automatic bar feed, is the No. 9A illustrated below cutting-off 8" stay bolts from 1" bars, 27 at a time.



ARMSTRONG-BLUM MFG. CO.

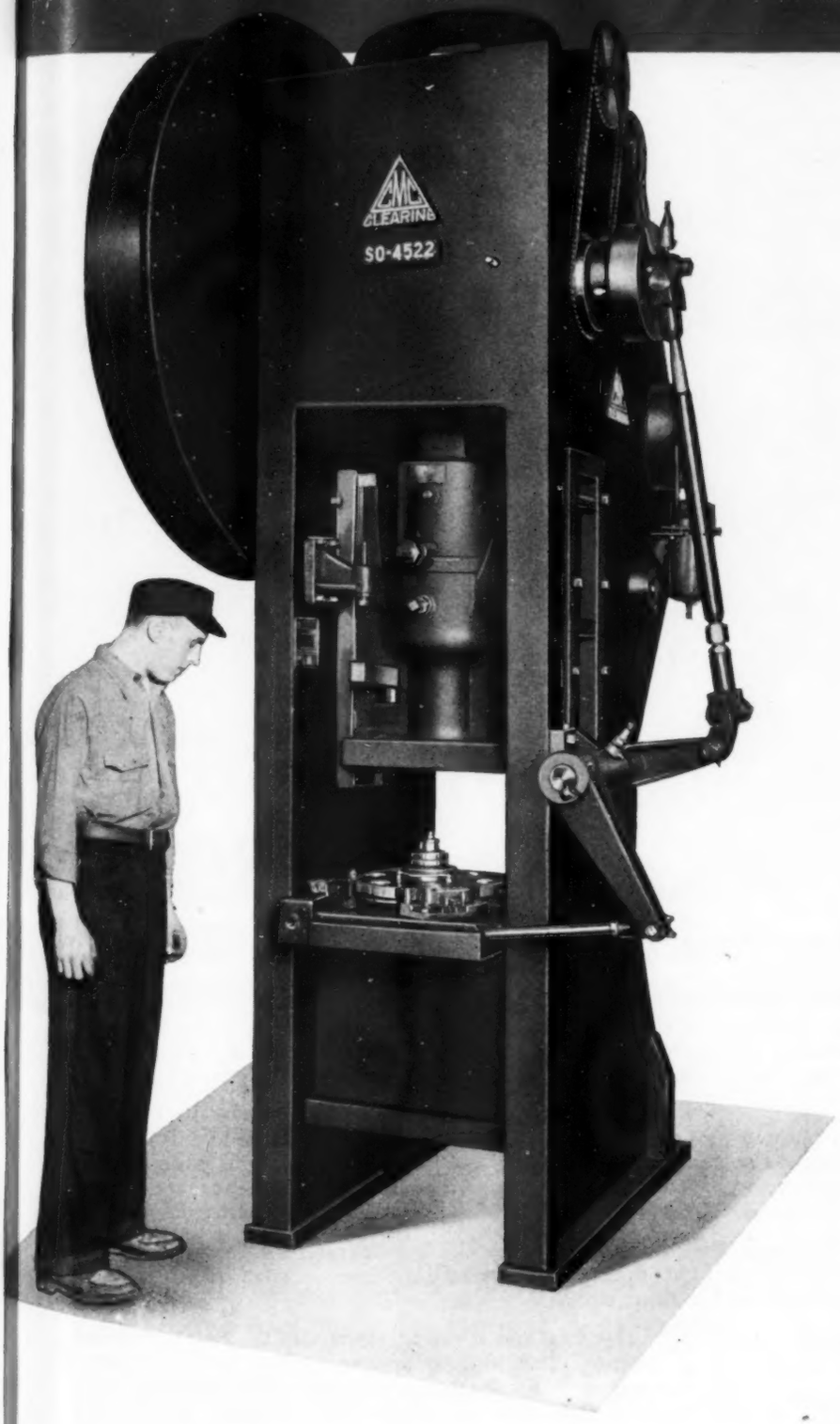
"The Hack Saw People"

5700 Bloomingdale Ave., Chicago, U. S. A.

Eastern Sales Office: **225 Lafayette St., New York**

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N. Y.

Set the pace for our firing line by increasing your Cartridge Case production



CLEARING

MECHANICAL AND HYDRAULIC PRESSES

FOR THE PRODUCTION OF BRASS AND STEEL CARTRIDGE CASES

A lineup of CLEARING Presses for the manufacture of 20 MM Steel Cartridge Cases is capable of producing 3,000 cases per hour. The 20 MM Brass Case lineup reaches the high production rate of 4,800 cases per hour. The CLEARING Mechanical press illustrated is used for the tapering operation on 20 MM Brass Cartridge Cases. The welded steel frame is fully stress-relieved. Pressure capacity is 60 tons. Its herringbone gears run in a bath of oil, assuring smooth and quiet performance. This Press is equipped with a ratchet dial feed mounted on the bolster for feeding two (2) cases into the dies at each stroke of the Press.

Designed for speed plus dependability, CLEARING Presses are being justly acclaimed in all types of armament work.

Let there be no American gun ever without ammunition. Begin today to add something to our country's war production.

CLEARING MACHINE CORPORATION
6499 WEST 65th STREET, CHICAGO, ILLINOIS

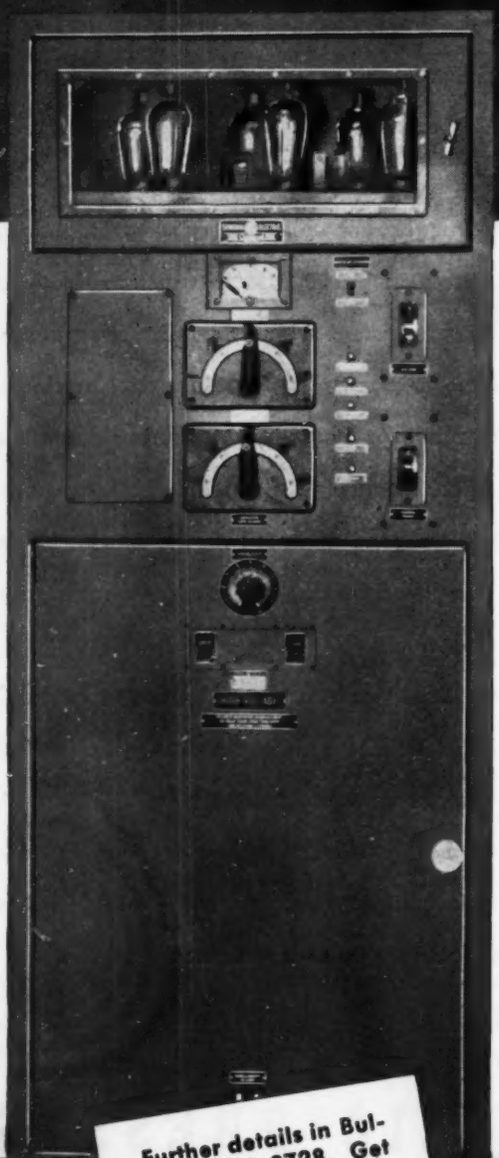
MECHANICAL AND HYDRAULIC PRESSES

CLEARING

MACHINE CORPORATION

CHICAGO

Photo courtesy Lockheed Aircraft Corporation



USE THIS NEW CAPACITOR DISCHARGE CONTROL

—ON YOUR STORED-ENERGY WELDING MACHINES

CONSISTENT values of current and timing, so vital to consistent aluminum-alloy welds, are assured when your stored-energy welding machines are equipped with a capacitor discharge control, one of G.E.'s newest developments.

Because of its low demand kva, this control also permits the use of a low-cost plant distribution system. Because of the low demand on the line, which means less voltage drop, you can economically install your welding machines at the most favorable places in your production line, even though the machine may be some distance from incoming distribution transformers.

Good voltage regulation afforded by the low demand kva also lessens the possibility of light flicker and limits interference with other welding equipment on the same circuit.

The time required for cleaning and dressing electrodes is greatly reduced with stored-energy welding. This is most apparent when welding heavy-gage aluminum alloys. Production is materially increased without compromise in weld quality, thus reducing rejects and boosting output and profits.

Designed by outstanding electronic engineers, General Electric's new capacitor discharge control is built for ease of installation and low maintenance.

Further details in Bulletin GEA-3728. Get your copy from the nearest G-E office. General Electric Co., Schenectady, N. Y.

GENERAL ELECTRIC

645-8748

FIRTHITE "HYPER-MILLING" HEADLINES THE NEWS!

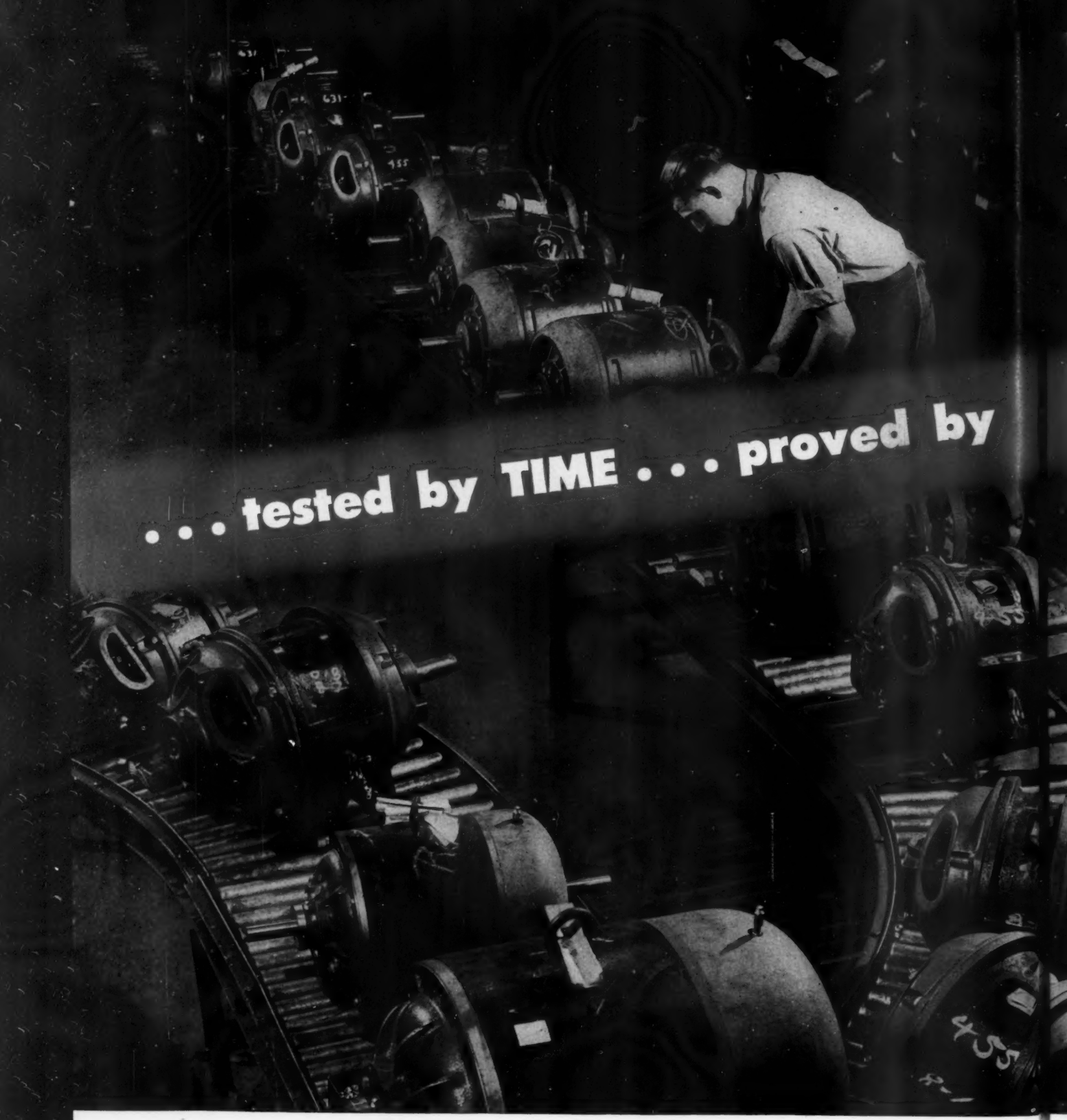
"HYPER-MILLING" is as novel in principle as it is sensational in results. It uses double negative-rake angles (i. e., negative spiral or helical angles **and** negative rake). The effect may be visualized by imagining the tips mounted on the **back of cutter blades** and the cutter running **backwards!**

A TYPICAL PERFORMANCE—Firthite Cutters, with 10° negative rake and 10° negative spiral (helix) angle, are operated up to **10 times the speed** with resulting **6 times the feed** of high-speed steel mills—on hardened, alloy-steel parts. (Ordinary cutters with carbide tips proved impractical on this job.) Firthite Tips in "Hyper-Milling" Cutters solved the problem!

"HYPER-MILLING" may solve that tough, steel-milling job in YOUR shop . . . **details on request.**

Firth-Sterling
STEEL COMPANY

OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT



Westinghouse

YEARS AHEAD IN DESIGN

EXPERIENCE . . .

Westinghouse CS Motors offer two vital advantages under today's conditions.

One is "years-ahead" design—the result of Westinghouse experience, development and research—which goes back to the first industrial use of alternating current.

The other is proved, *known* performance that enables round-the-clock schedules to be set up and maintained without fear of motor failure. Hundreds of thousands of Westinghouse Motors in use for five, ten, twenty years and even longer have proved their soundness.

WESTINGHOUSE INTRODUCED SEALED SLEEVE BEARINGS IN 1925 TO SEAL OIL IN AND TO KEEP DIRT AND DUST OUT . . . IN 1928 WESTINGHOUSE ADOPTED RIGID ONE-PIECE FRAMES FOR STRENGTH AND TO PROTECT AGAINST TWISTING STRAINS AND VIBRATIONS . . . TUFFERNELL INSULATION HAS BEEN A WESTINGHOUSE FEATURE SINCE 1930 THIS GIVES EXTRA DIELECTRIC STRENGTH AT VULNERABLE SPOTS IN SLOT CELLS AND END TURNS . . . ALSO, INSULATION IN EVERY MOTOR IS SUBJECTED TO A SPECIAL WESTINGHOUSE RADIO-FREQUENCY TEST.

J-21232

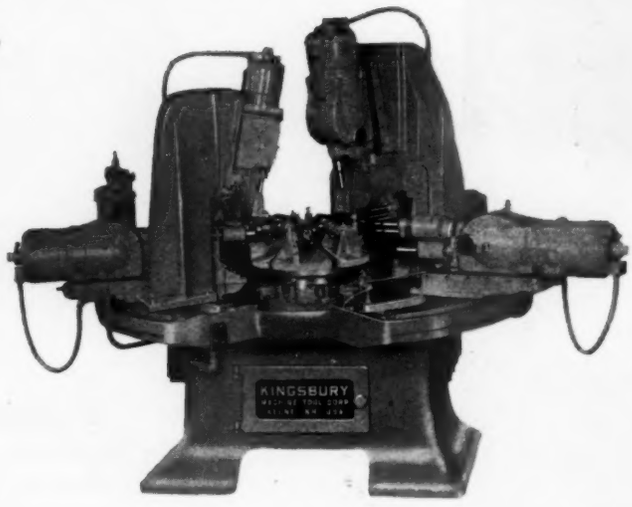
Call your nearest Westinghouse office today for full details and prompt action. Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

CS MOTORS

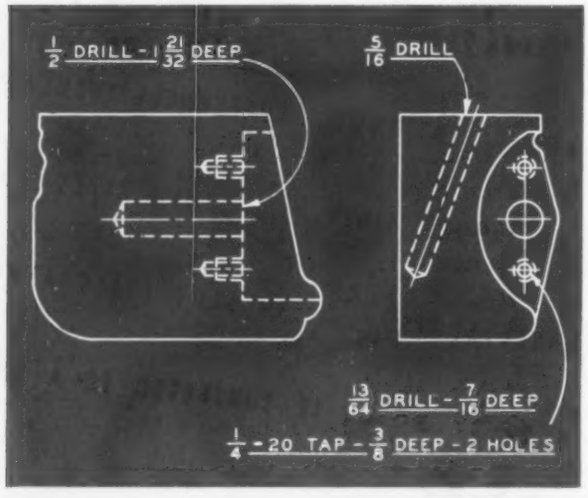
FLEXIMATIC

by KINGSBURY

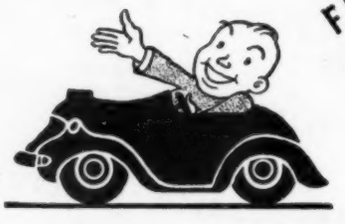
For High Speed Drilling of Compound Angle Holes



The design of this part, a cast-iron bracket for an automatic automotive transmission, requires the drilling of a 5/16" hole at a compound angle. KINGSBURY automatic drilling units, compact and readily mounted in any position, make it possible to simplify and speed up this operation. Only one chucking is required; a finished part, completely drilled and tapped, is produced with each index of the table. Kingsbury FLEXIMATICS are performing all types of multiple operation jobs, doing them at production speeds, turning out highly accurate work and reducing the necessity for a number of separate operations requiring skilled labor.



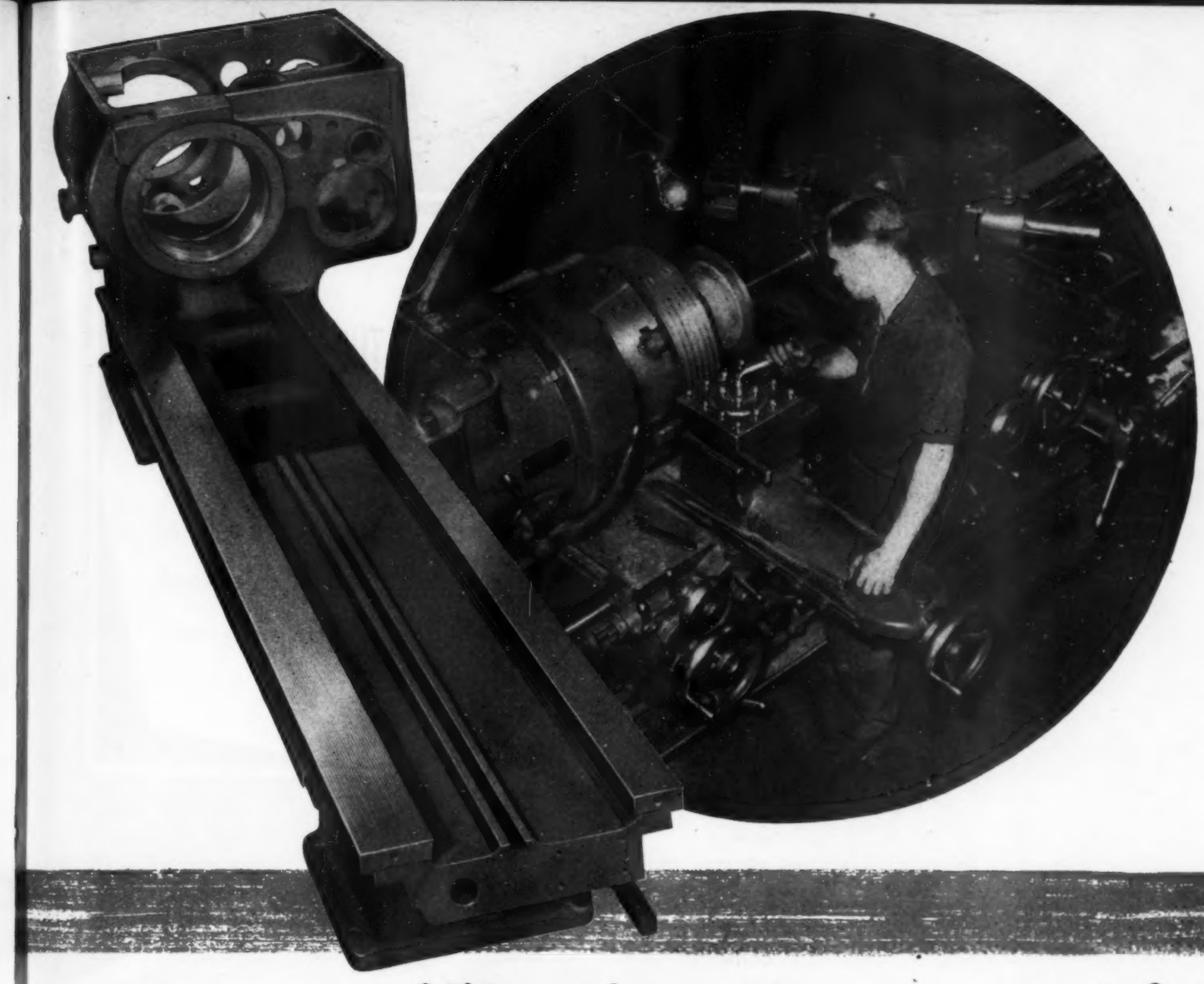
The FLEXIMATIC system of construction consists of standard Units for drilling, tapping, boring, reaming, spot-facing, etc. Mounted on one of several standard bases. This unique method provides a flexible setup which can be changed over to meet the machining requirements of many different parts.



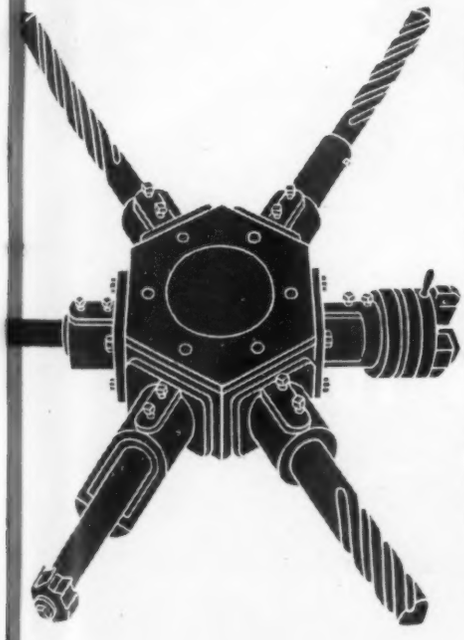
THIS IS A FLEXIMATIC AUTOMOTIVE JOB!

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U. S. A.



Why this extreme rigidity
IN GISHOLT TURRET LATHE DESIGN?



Where machining calls for precision, there's no substitute for the extreme rigidity found in Gisholt turret lathes. Heavy bed and headstock are cast as a single piece with headstock walls extending well above the spindle. Heavy cross-ribbing assures rigid support for shaftbearing seats. Hardened steel bed ways, securely anchored, are ground in perfect alignment with the spindle.

By eliminating the causes of vibration, Gisholt construction enables you to take the heaviest cuts without chatter—to hold precision at higher cutting speeds.

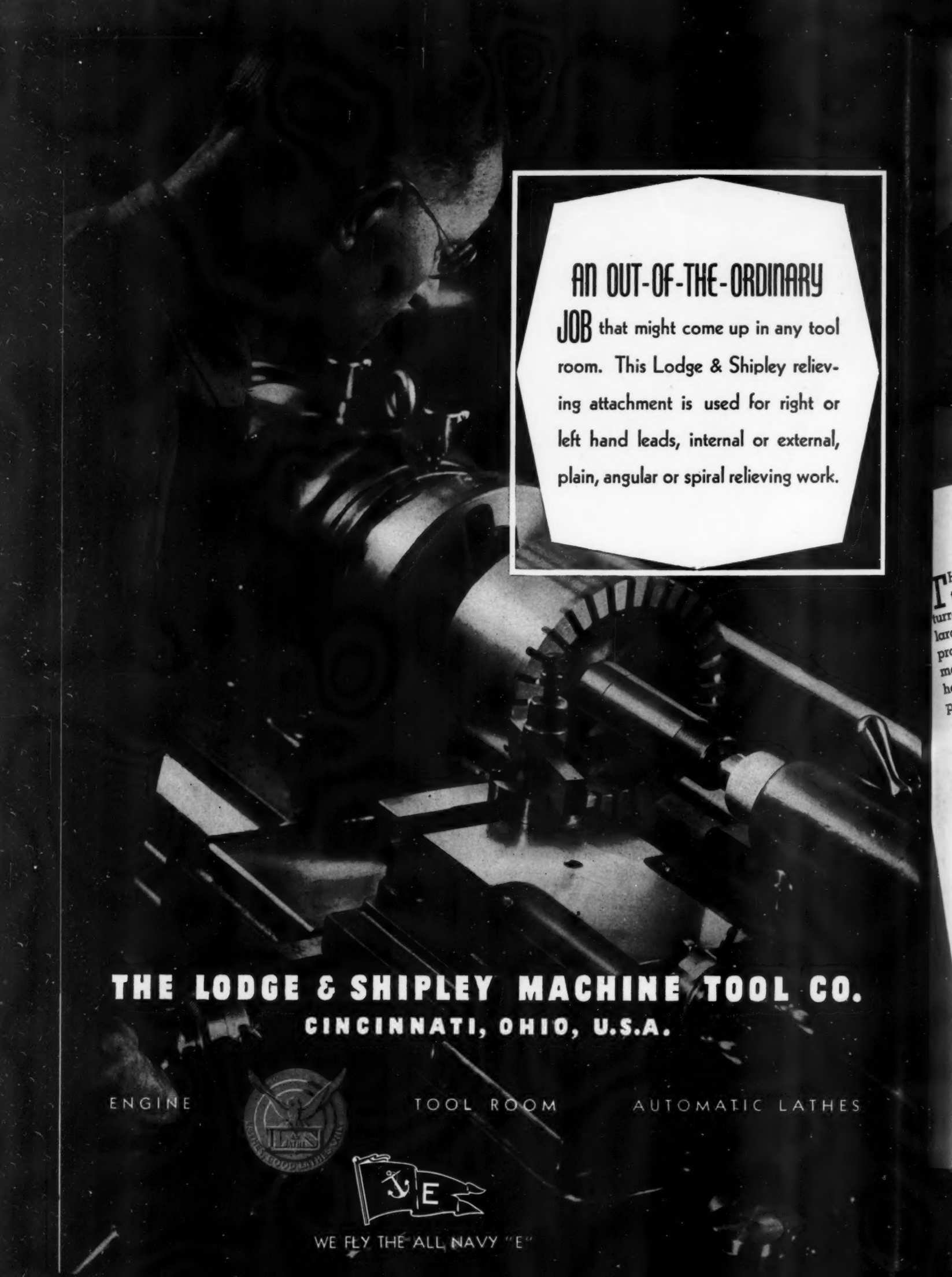
"Gisholt for accuracy" is no mere catch phrase. Behind it is more than a half century of successful turret lathe building.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison, Wisconsin

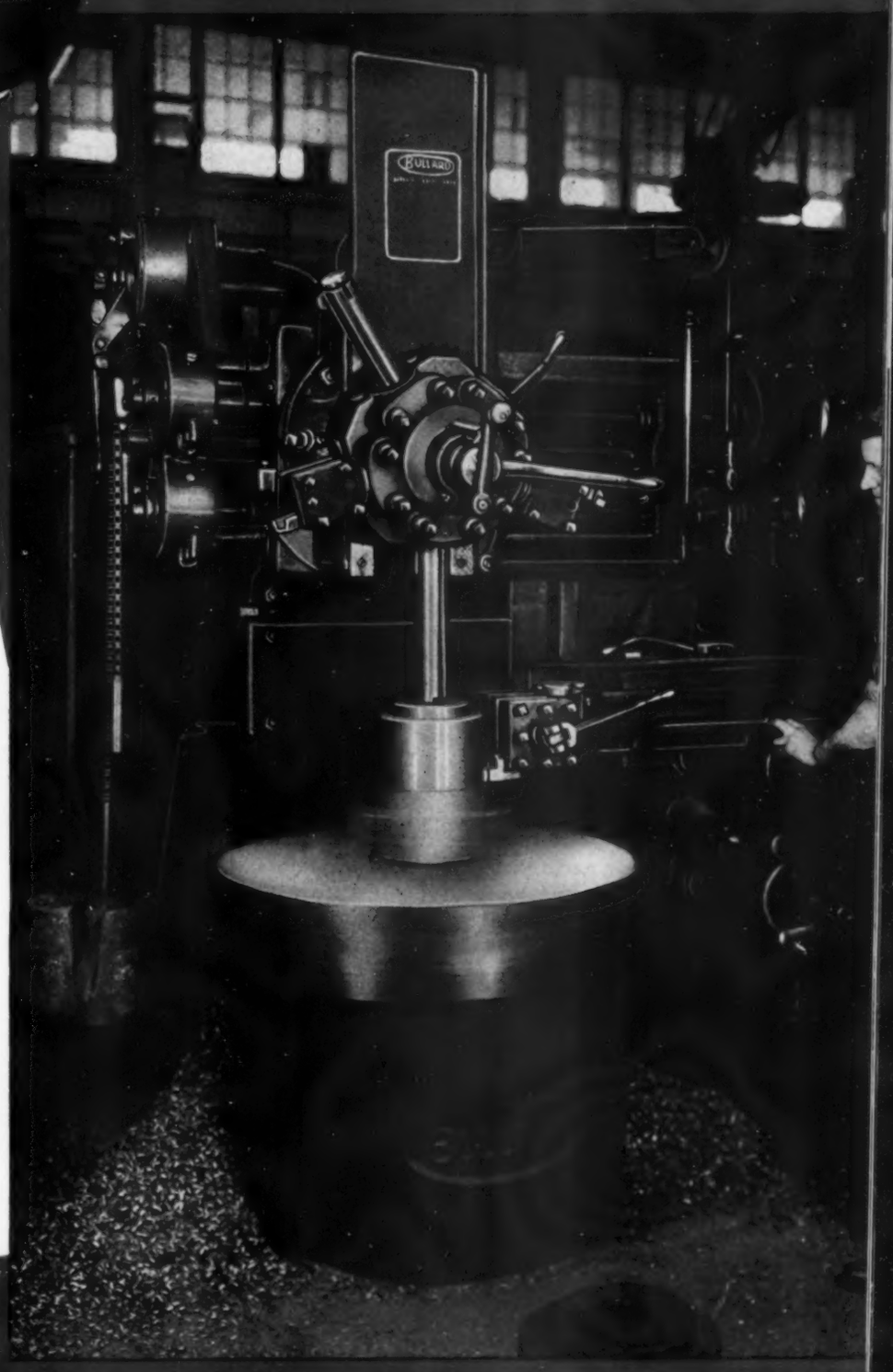
GISHOLT

LOOK AHEAD—KEEP AHEAD—WITH GISHOLT IMPROVEMENTS IN METAL TURNING

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES


AN OUT-OF-THE-ORDINARY
JOB that might come up in any tool room. This Lodge & Shipley relieving attachment is used for right or left hand leads, internal or external, plain, angular or spiral relieving work.
THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.
ENGINE
TOOL ROOM
AUTOMATIC LATHES
WE FLY THE ALL NAVY "E"

"I can handle that on our V.T.L."



THIS photo shows how the ability to cut **simultaneously** with main turret and side head makes the Bullard Vertical Turret Lathe a low-cost producer. 5 tooling stations on the main turret and 4 tools on the side head make 9 separate operations possible.

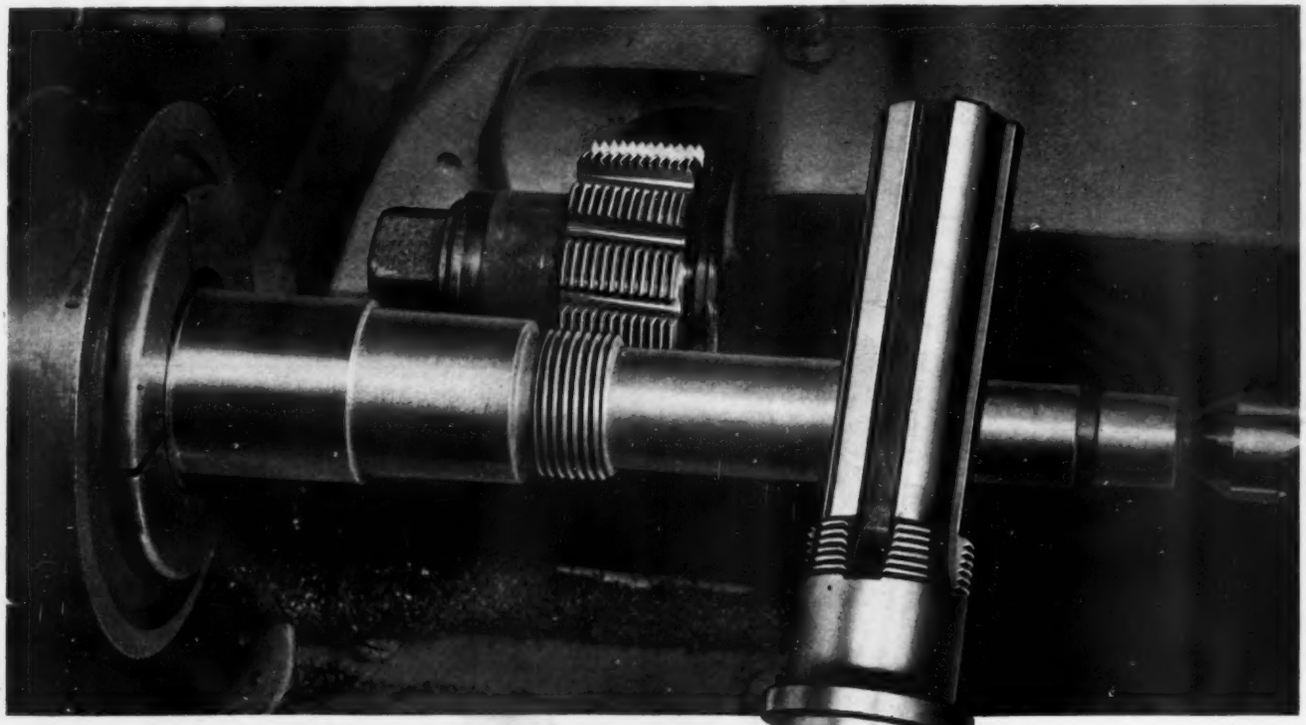
Air conditioning equipment manufacturers are now using V.T.L.s for valve bodies, compressor parts, pipe flanges, gear blanks, packing rings, sheaves and the like.

Put either jobbing or production work on the V.T.L. for fast economical production and sustained accuracy.

BULLARD

THE BULLARD COMPANY

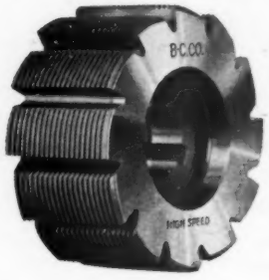
BRIDGEPORT, CONNECTICUT



THREAD MILLING TO CLOSE LIMITS

THE threading on these tractor sprocket shafts is accomplished at the rate of one piece every five minutes, floor-to-floor time. Inspection requirements call for *"only a slight drag on the thread gauge."* Limits on Pitch Diameter and the O.D. are .002". The cutter is a Barber-Colman Ground topping Multiple Thread Mill, with helical gashes (for smoother cutting). This is only one of many instances where B-C Thread Mills are performing outstanding production service, being made in a wide variety of types and sizes, both ground and unground. If you have similar metal cutting problems involving accuracy, higher production or lower tool costs, why not consult the regular B-C Engineering Service. Quotation and recommendations will be made upon request, without any obligation.

One operator performs two threading operations on this piece, using two machines. The large center thread is cut as shown above, and the piece is then transferred to a second machine for milling the end thread. Each cutter is run for 16 hours, then changed.



BARBER-COLMAN MULTIPLE THREAD MILLS

This is the correct term for the type of thread mill shown above, which has no lead and which can be made for cutting any type of screw thread such as American Standard, "V", Briggs, A.P.I., Whitworth, etc. For further data on Thread Mills, consult your nearest B-C representative.

DATA ON THIS JOB

Center thread (shown above) — 2.1959"/2.1939" pitch dia., 12 pitch.

Material — SAE 1045 forging, 217 Brinell.

Holding Means — collet chuck, outer center support.

Cutter — B-C Multiple Thread Mill, 4" x 1-1/2" x 1-3/4" hole, ground, helical gashes.

Cutter speed — 96 r.p.m.; work speed — 2 min. per rev.

Cutter life — 192 pieces per grind.

Production — 12 pieces per hour

BARBER B-C COLMAN PRODUCTS
MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

Announcing A New Uniform for the famous Red Belt

TEXROPE Goes to a war-time black!

YOU STILL GET . . .

1. The 50% stronger cords made possible by the sensational new Flexon process.
2. The 20% more cords that help give Texrope Super-7 V-Belts their extra "muscle".
3. The increased life provided by Texrope's shock-absorbing, cool-running rubber cushion.
4. The extra protection against grit, grease and dampness of the duplex-sealed cover. The *only* thing changed in cover design is the color!

WHAT: It's a change in Texrope* Super-7 V-Belt *color* . . . from its well-known red to a war-time black. The *only* change in design is in color — and the color change is only skin-deep.

WHY: To free additional stores of red-pigmented rubber for meeting America's special and growing war-time needs, Allis-Chalmers gladly surrenders — on its own initiative — the red surface pigmentation of Texrope V-Belts.

WHEN: Texrope V-Belts are being produced in black *now* . . . and with stocks of red belts on hand you are assured of no curtailment in supply or in the range and number of sizes available.

Texrope's loss in identifying color is Uncle Sam's gain. That's right and proper. And *your* loss is zero. *Every last one of the famous Texrope design features remains the SAME!*

Today, when your production depends on your V-Belt equipment, get *all* the advice and help that's yours for the asking at your Texrope dealer or nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee, Wis.

*Trade mark registered U. S. Patent Office. Texrope Super-7 Belts are the result of the co-operative research and design genius of *two* great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. A 1516

Available in all sizes ½ hp to 2,000 hp

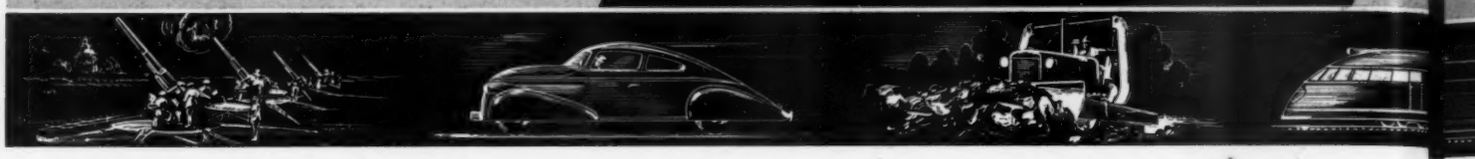
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

WE WORK FOR VICTORY — WE PLAN FOR PEACE

VICTORY PRODUCTION SPECIFIES MICROHONED BORES

to

keep 'em round
keep 'em straight
keep 'em interchangeable
keep 'em rolling
keep 'em firing



Micromatic Hones range from sizes for bores .303" to 30" in diameter—from ¼" to 900" long. They remove stock at the average rate of .001" per minute on diameter, in usual applications.

Automatic Microsize Control is available for bores up to 2" in diameter and 6" long, to hold uniform size within .0005" in production.

The Microhoning process will generate accuracy for roundness and straightness of bore within .0002" to .0003" in most parts, and within .001" in larger sized bores in high production. Stock removal ranges up to 65 cubic inches per hour in conventional applications.

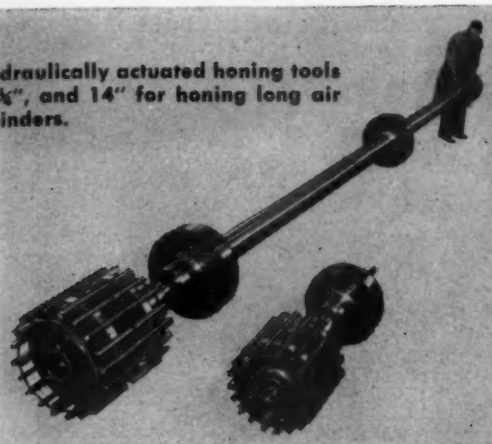
Microhoning reduces processing time cost for some applications by approximately 90% over previously used methods of processing. Send for Bulletin AR-60.

SAVE TIME
SAVE METAL
SAVE COST
IMPROVE QUALITY

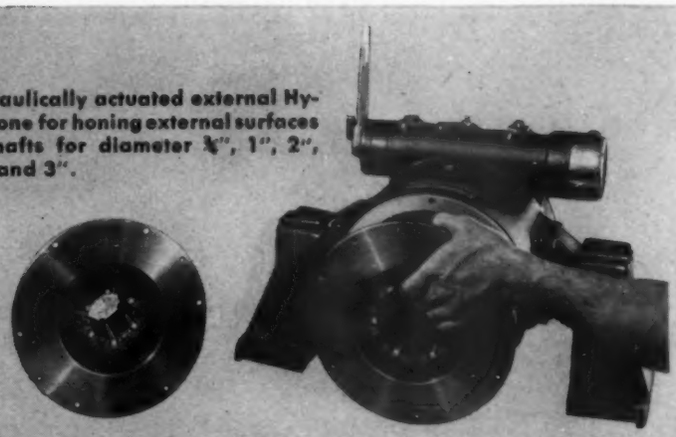
with
MICROHONING

MICROMATIC HONE

Hydraulically actuated honing tools 18¾", and 14" for honing long air cylinders.



Hydraulically actuated external Hydrohone for honing external surfaces of shafts for diameter ¾", 1", 2", 2¾" and 3".

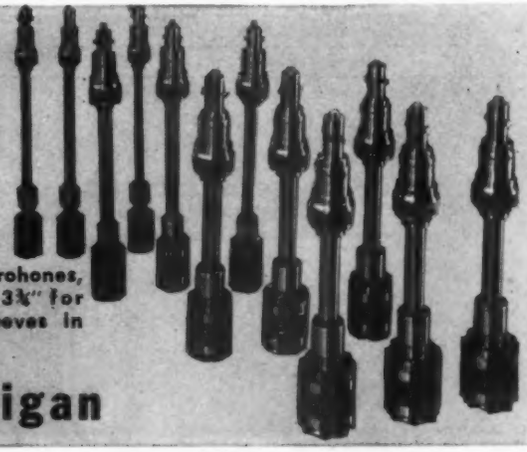


Model 200 Hydrohoner with Microsize Control and Automatic Feed and delivery for complete automatic production honing.

MICRO MATIC

Model H-2 Micromatic Hydrohoner arranged with Microsize Control Units for honing certain gun tubes.

Micromatic Huttohones and fixture for honing fork and blade connecting rod bores used in straight line aircraft engines.



Hydraulically actuated Hydrohones, sizes 5¾", 5¼", 4¼" and 3¾" for honing tractor engine sleeves in high production.

CORPORATION **Detroit, Michigan**

This is the Home of

FENN QUICK ACTION VISES

FOR MILLING, DRILLING, TAPPING AND ASSEMBLING OPERATIONS

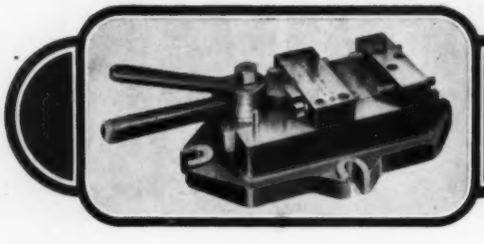
THE Fenn special features make this famous vise specially effective on milling, drilling and tapping operations—operations where speed counts. And The Fenn does this because of the quick action cam lever which throws the jaws together instantly, uniformily and securely. Then the eccentric handle locks the work in a doubly secure grip. There is a precision adjustment to the jaws of this vise that is extremely important on fine work—an adjustment that is unsurpassed.

SPECIFICATIONS OF FENN *Quick-Action* VISES

Size of Vise	4"	5"	7"
Length	10"	13"	15¾"
Width	7"	8"	8¼"
Height	4"	4¾"	6"
Net weight	21 lbs.	35 lbs.	88 lbs.
Shipping weight in carton	26 lbs.	40 lbs.	93 lbs.
Extreme opening without jaws	3¼"	4 3/16"	6 7/16"
Extreme opening with both jaws	⅜" thick jaws 2½"	½" thick jaws 3 3/16"	⅝" thick jaws 5 3/16"
Maximum working opening (grip) without both jaws	2 9/16"	3 5/16"	5 1/16"
Maximum working opening (grip) with both jaws	⅜" thick jaws 1 13/16"	½" thick jaws 2 5/16"	⅝" thick jaws 3 13/16"
Width of key for locating on machines	⅝"	⅝"	⅝"
* Center distance of Bolt Holes	3 1/16"	3¼"	4"

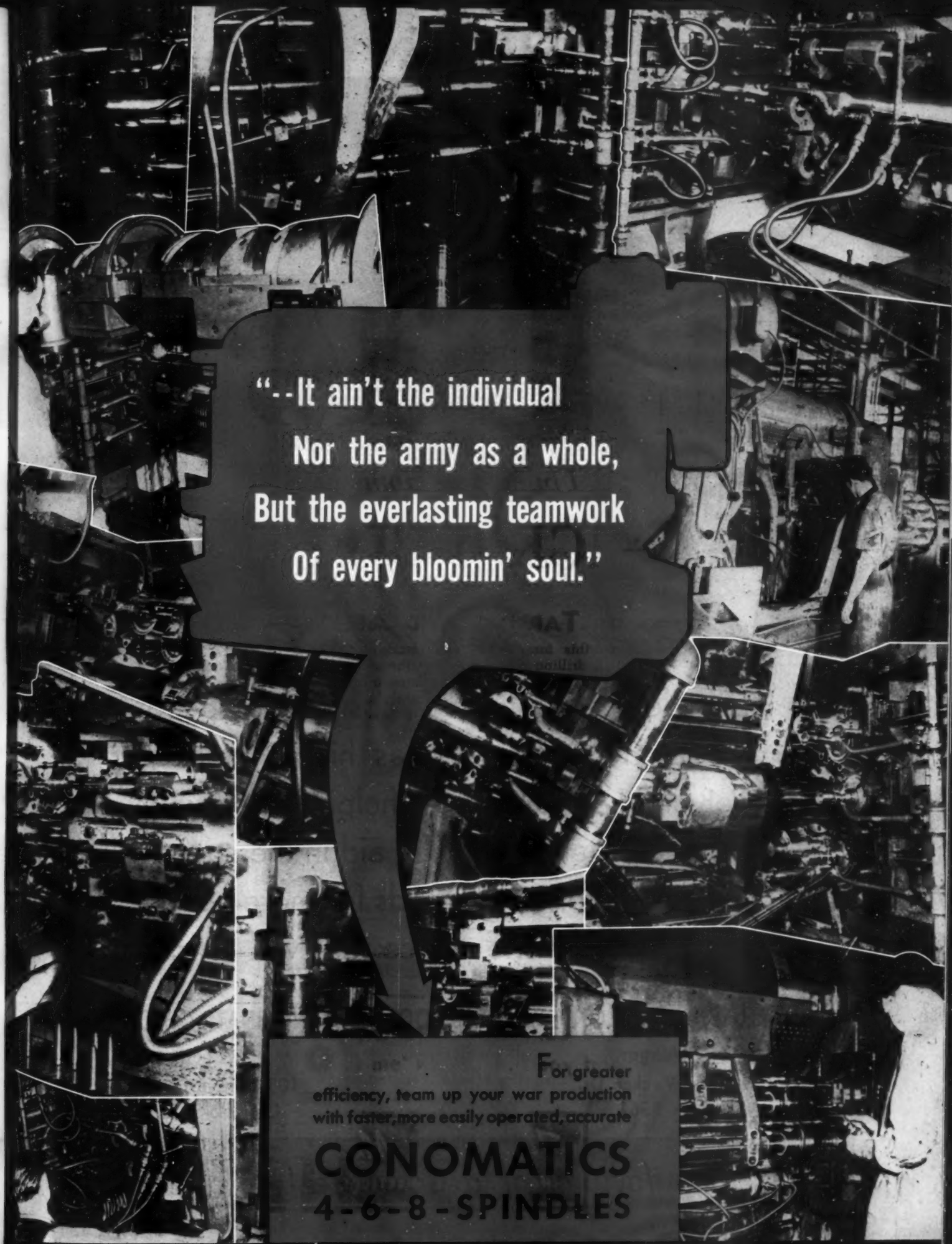
* Bolt Holes can be located as per customer's specifications if standards do not apply.

Send for descriptive Bulletin No. 10 with complete details. Learn whether or not you can "finish 'em faster with a Fenn."



The Fenn Manufacturing Co.

HARTFORD, CONNECTICUT - - ESTABLISHED 1900


"--It ain't the individual
Nor the army as a whole,
But the everlasting teamwork
Of every bloomin' soul."
For greater efficiency, team up your war production with faster, more easily operated, accurate
CONOMATICS
4-6-8-SPINDLES
IF IT'S A CONE
IT'S ACCURATE
CONE AUTOMATIC MACHINE CO., Inc.
WINDSOR, VERMONT

Le Blond Lathes in War or Peace . . .

are dedicated to low cost, high speed, precision turning. Just as highly efficient LeBlond Lathes are now helping speed our victory, so also will they aid in the speedy production of more goods for more people at less cost in the peace that will follow.

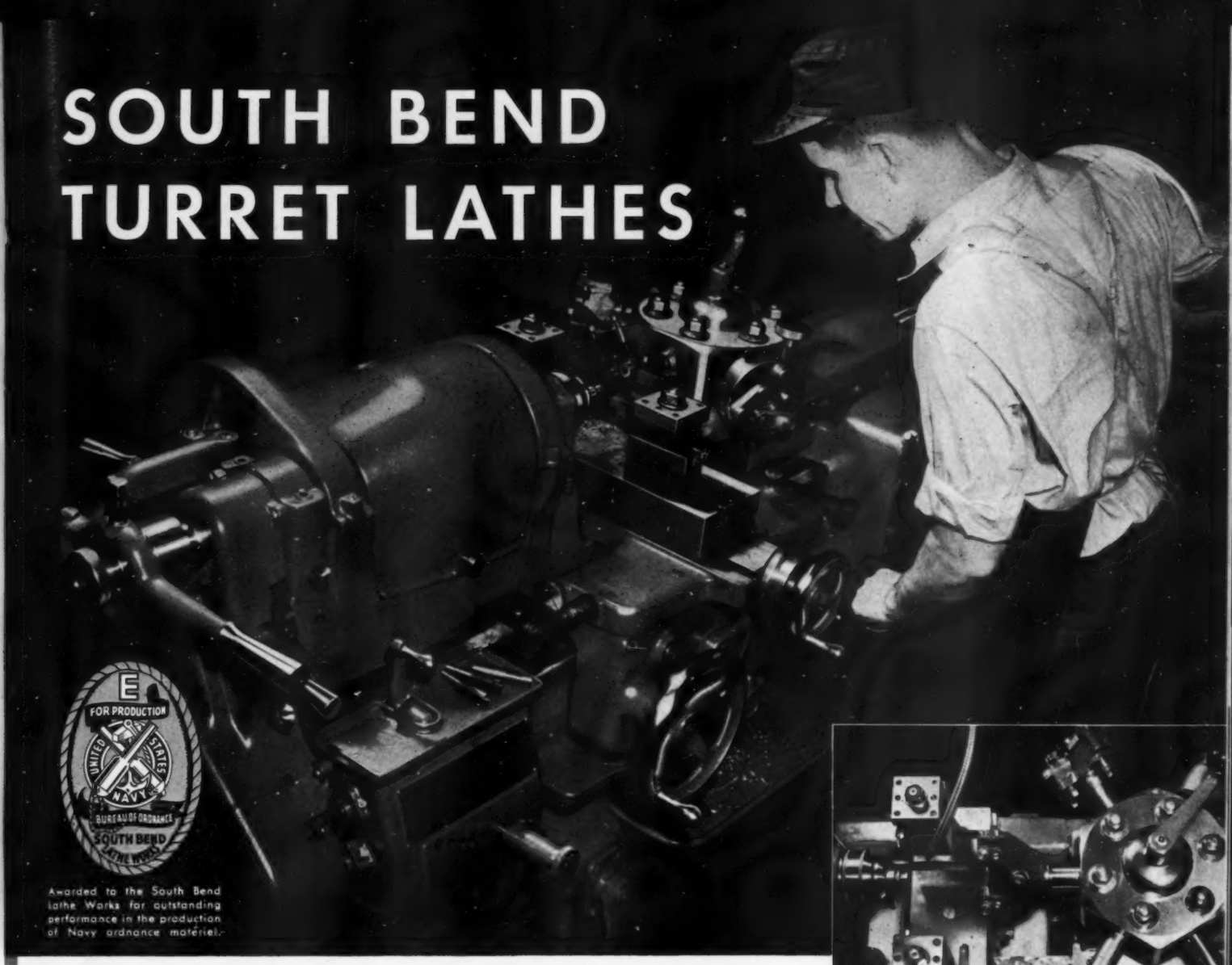
THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI, OHIO

Chicago:
20 N. Wacker Dr.
STA 5561

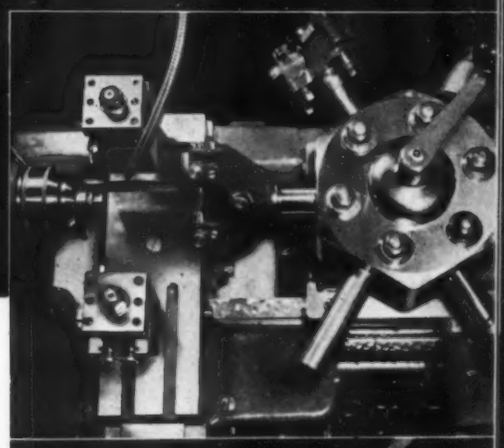
New York:
103 Lafayette St.
Canal 6-5281

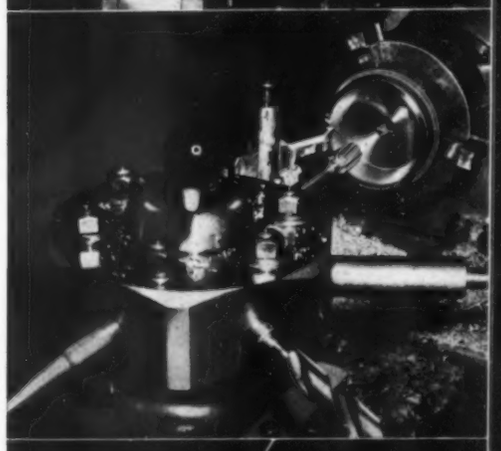
Largest Manufacturer of a Complete Line of Lathes

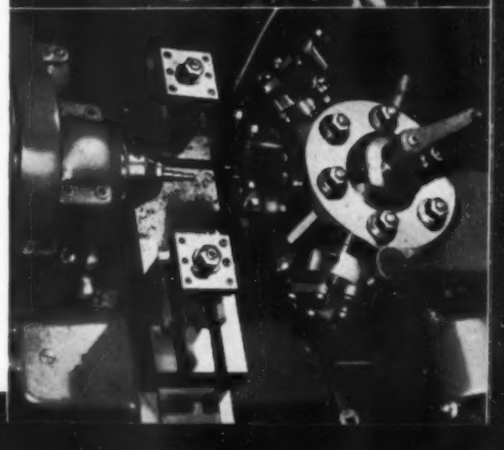
SOUTH BEND TURRET LATHES



Awarded to the South Bend Lathe Works for outstanding performance in the production of Navy ordnance materiel.







Productive Versatility

South Bend Turret Lathes have the kind of versatility that speeds production on many classes of work. A wide range of spindle speeds permits maximum cutting tool efficiency. Rapid change from high speeds to low speeds saves time on thread cutting and reaming operations. A quick change gear box provides 48 changes of power feeds for the universal carriage and the turret. The universal carriage has 48 precision thread cutting feeds driven through a lead screw and half-nuts.

Standard extras include compound cross slide, four-way turret tool block, micrometer carriage stop, thread indicator dial and taper attachment. These attachments simplify tooling the lathe for many classes of work, and make it especially adaptable to second operation jobs.

The South Bend No. 2-H Turret Lathe has a chucking capacity of 16¼″ swing over the bed and saddle wings, a spindle bore of 1⅜″ and a collet capacity of 1″ for round stock. Twelve spindle speeds (16 to 880 r. p. m.) are provided. The effective feed of the turret slide is 6⅛″ and the distance from spindle nose to turret is 30½″. Complete specifications are contained in Bulletin 67-T, which will be sent upon request.

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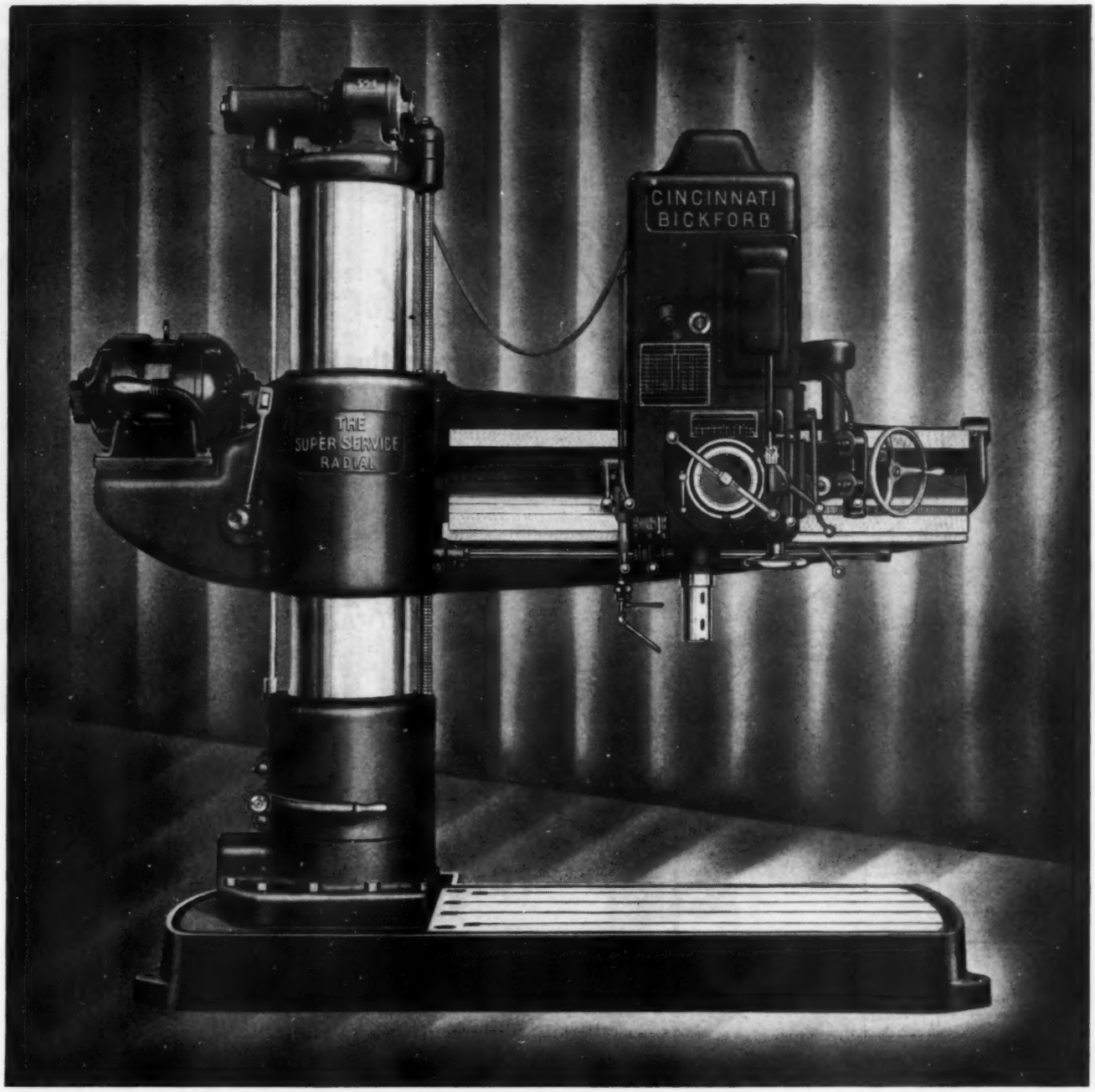

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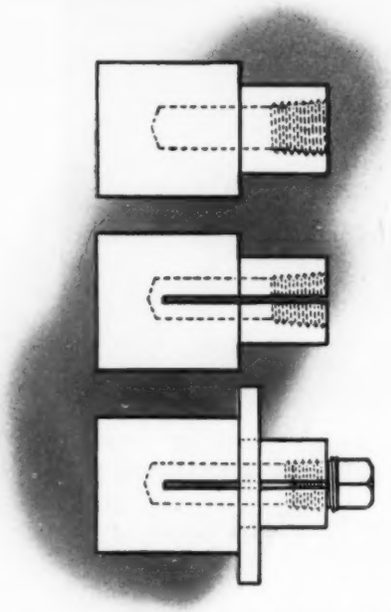
A CITATION FOR MEN IN WAR INDUSTRY



One suggested method for holding second operation work, requiring location from the bore: A piece of stock is turned, slotted, and tapped with taper thread. Work pieces are loaded on this plug. A pipe plug is then used to expand and tighten the arbor against the internal diameter of the work piece.

He Didn't Wait for a Tool Room Arbor!

J. H. Medling, with the Aro Equipment Co., Cleveland, developed a relatively simple plug to hold small diameter washers quickly and accurately without losing valuable time waiting for a special arbor to be made up in the tool room.

The accompanying drawing shows operator Medling's "Idea for Victory"—an idea which may be helpful to other operators.

Many operators are resourceful and ingenious in finding ways to produce more finished pieces on their turret lathes.

Many of these ideas are sent in by operators, to be published in "Blue Chips," a timely shop bulletin mailed regularly to turret lathe operators on our list. Are your turret lathe operators getting Blue Chips? If not, we will gladly send it to their homes.

YOU CAN TURN IT BETTER,
FASTER, FOR LESS...WITH A WARNER & SWASEY

WARNER & SWASEY
Turret Lathes
Cleveland

WHAT'S IN THIS ISSUE

FORGING ALUMINUM

Companies with facilities for forging aluminum have been working at capacity to meet the needs of our vast production program. But today the demand for aluminum forgings exceeds the supply. This demand can be met by plants with steel-forging experience providing they have an understanding of the problems involved in forging aluminum. Answers to these problems, including the maintenance of accurate forging temperatures and shrinkage tolerances are given by Herbert Chase. Page 491.

HERBERT CHASE

SIMPLIFIED BLUEPRINT READING

The ability to read blueprints requires training and much practice—more in fact that can be acquired by the thousands of new men trained quickly for jobs in war production plants. But such men can visualize parts readily if isometric three-dimensional drawings or sketches are used. Such sketches can be broken down into essential details, giving only that information needed by each man in the performance of his assigned duties. Page 505.

LOCOMOTIVE SAVINGS

One item of locomotive maintenance expense—machining of frame bolts—can be reduced drastically by using a specially tooled turret lathe. An engine lathe, producing one large bolt every 15 to 30 minutes, can't compare with it. J. E. Carroll, tool supervisor, Southern Railway System, tells how one turret lathe makes 200 $1\frac{1}{4}$-in. bolts in 8 hr. Page 500.

MORE ABOUT CAMS

Grooves in radial or plate cams can be milled accurately on a rotary head milling machine. Neither a dummy templet, cam slide or dividing head is required. Once the blank is set up on the rotary table, the spindle and cutter can be located by graduated screws and dials to machine any combination of arcs and tangents. Production is faster than by any other method. H. A. Frommelt, director of industrial research, Kearney & Trecker Corporation, gives the details in the current installment of his cam milling series. Page 502.

TOPS IN INSPECTION

Perfect nuts and bolts with precision threads are essential in the aircraft industry. They have to pass rigid inspection under thread comparators, magnetic testers and microscopes. The article on this subject tells why imperfections and flaws don't have a chance of getting by such equipment. Page 496.

SAVE OXYGEN

Insignificant losses of oxygen and acetylene at individual flame-cutting and gas-welding units can amount to incredible volumes in plants where requirements for these gases have been multipled many times because of increased war production. Hints that help reduce such losses are emphasized by cartoons. Page 494.

LINES FOR SHELL CASES

Many plants are still setting up production lines for ordnance materiel such as shell and shell cases. Such lines, capable of producing thousands of cases a day, can be set up in very small areas, providing equipment is arranged so there is no backtracking between presses, annealing furnaces and machine tools. One plant in the middle west has such a layout. Its description will be found in the second article of the Armament Section. Page 521.

ASSEMBLE GEARS PROPERLY

The best gears that anyone can make will be unsatisfactory if installed improperly. For this reason the American Gear Manufacturers Association has adopted standards giving recommended practice for adjustment of bevel gears in assemblies. These standards are in Reference Book Sheets. Page 529.

R. A. STEINBAUER

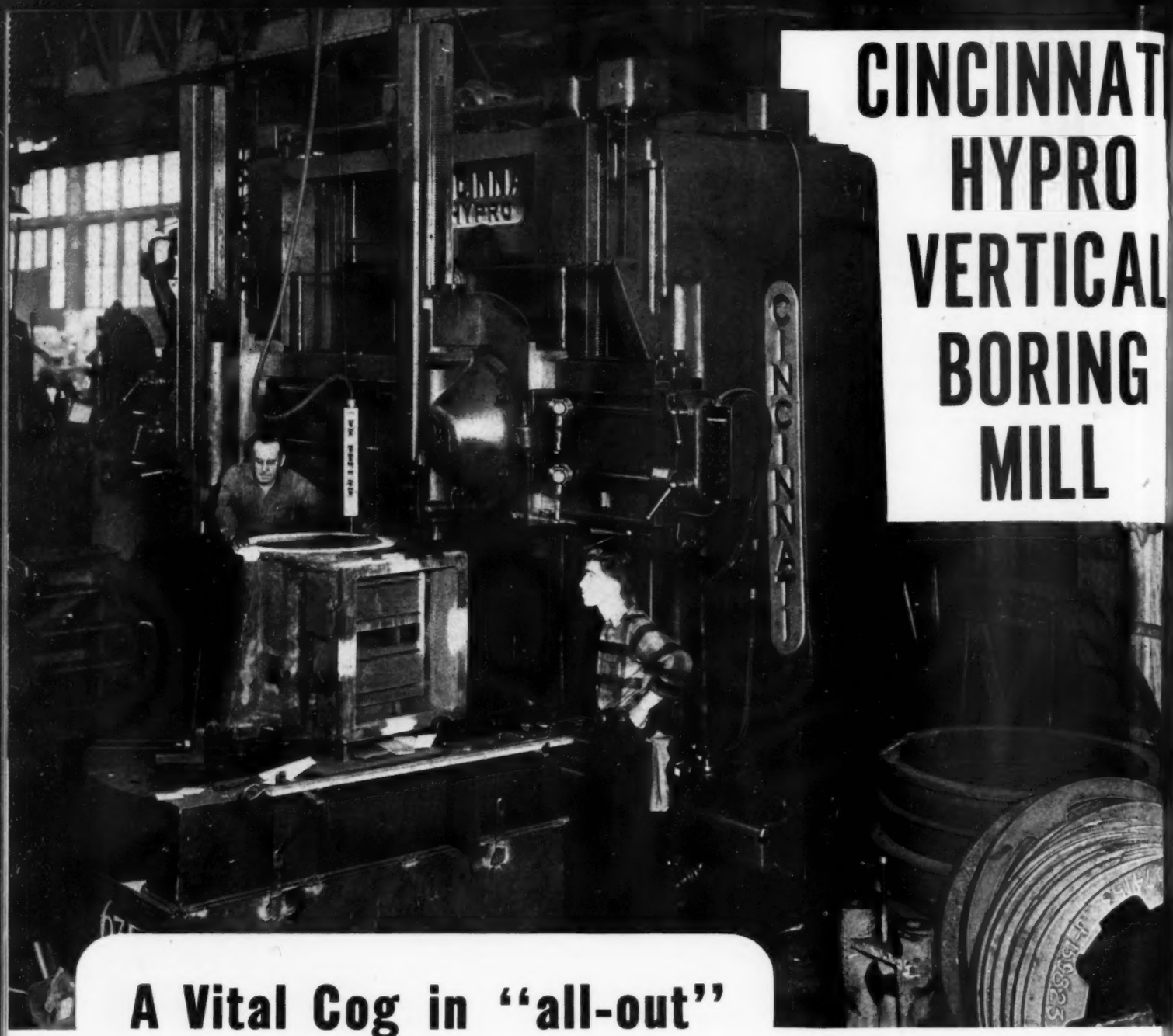
BOMBERS' BIRTHPLACE

This time last year existing airplane plants could not meet the demand of our great bomber production program. New plants were built. And these are today turning out bombers in unprecedented numbers. The facts about one such plant are presented by R. A. Steinbauer in the Armament Section. The plant is designed not only for peak production, but also for maximum protection of plant equipment and workers in case of air raids. Page 513.

COMING

As plant after plant stops production of civilian goods and tackles the job of tooling up for war, more and more metal-working plants want specific facts on how to get going quickly. An aid toward this end will be found in the June 11 AMERICAN MACHINIST.

The entire issue is devoted to a plant-by-plant report of the automobile industry's conversion program, telling how the vast network of automobile plants is being coordinated into a vital unit of our giant armament production effort. There will be many ideas and suggestions on almost every phase of metal-working, all applicable to problems in many types of plants. These include conversion of general- and single-purpose machines to war production with the aid of new jigs, fixtures and dies, as well as the redesigning of machine tools to do jobs other than those for which they were originally made. Then too there will be typical examples of how veteran and new workers in peacetime plants are being trained in their new wartime jobs.



CINCINNATI HYPRO VERTICAL BORING MILL

A Vital Cog in "all-out" War Production

Here an 8 foot Cincinnati Hypro Vertical Boring Mill is machining a Steam Engine Cylinder for a large dredge in the plant of a Heavy Equipment Manufacturer.

And like all Cincinnati Machines this Boring Mill has stamina to stand up under heavy cuts in alloy steel castings—rigidity to maintain close tolerances—speeds and feeds to assure "all-out" production in the present emergency and for years to come.

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Cincinnati also builds a full line of Hypro Planers and Planer Type Milling Machines from 30" to 120".

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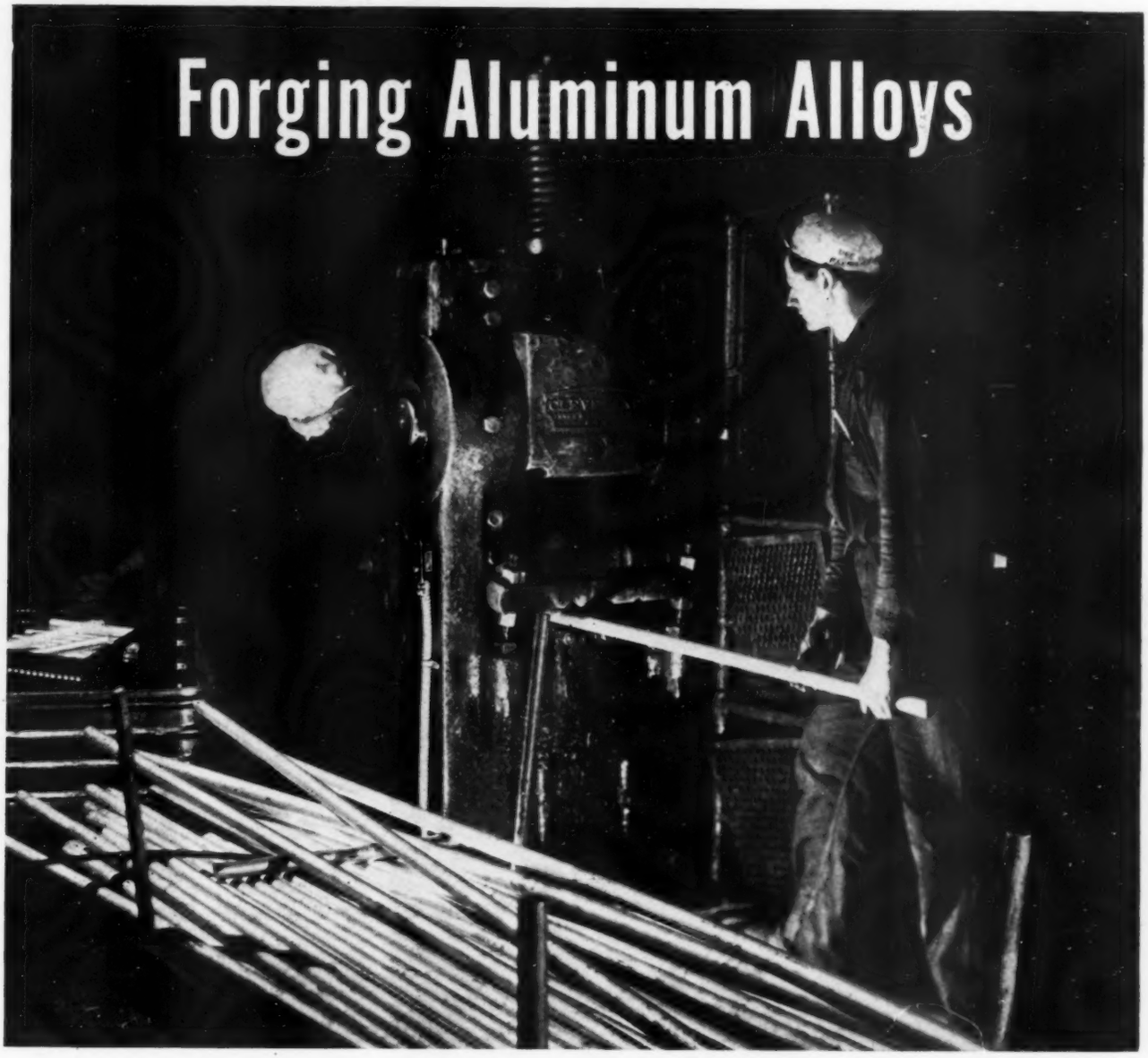
Cincinnati, Ohio

Forging Aluminum Alloys



Round forging stock is sheared into short lengths ready for use in producing drop forgings

BY HERBERT CHASE

1—How do forging methods differ for aluminum from those used for steel? Here is an account of methods in use today

FORGING ALUMINUM alloys, especially when using forging dies on steam and board hammers, is similar to forging steel. The hammers employed are identical. Dies can be much the same, though shrinkage allowances and certain other details of die construction may differ.

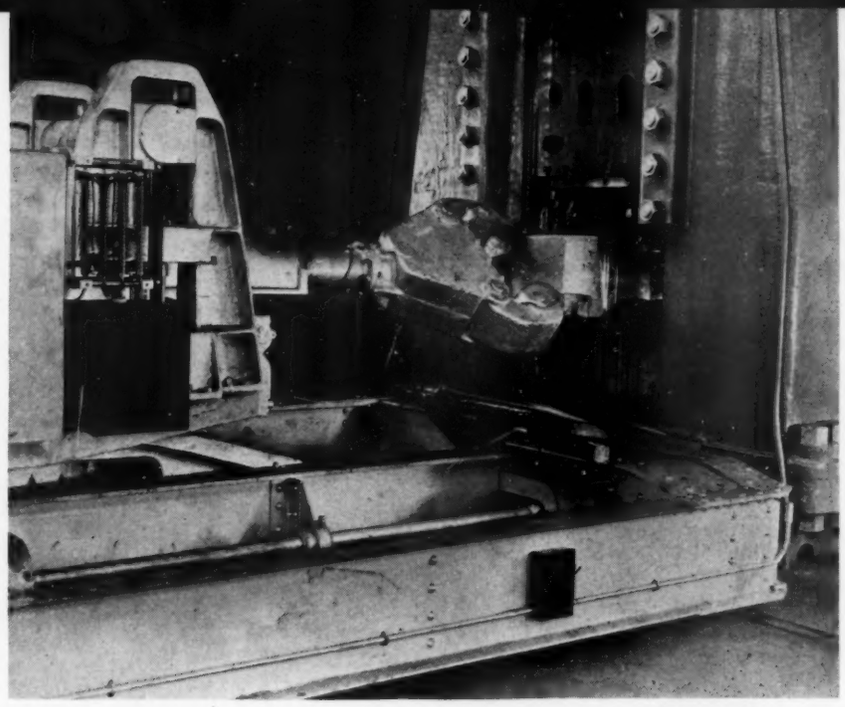
Furnaces can be similar, but those for aluminum have to be operated at a lower temperature than for steel, and closer temperature control is desirable if not essential. For aluminum, the power required is about 25 percent greater than for carbon steels but about the same as for such alloy steels as those in the 4100 series.

On the other hand, forging aluminum requires a technic which differs in many details from that on steel, because of differences in the two types of materials. Aluminum alloys become hot short above certain critical temperatures and have to be forged below these temperatures. It is desirable, however, to forge at as high a temperature as possible and still avoid hot shortness; high temperatures permit the metal to flow more readily. For this reason, an effort is made to hold the temperature within a range

of about ±10 F. of that desired for the particular alloy being used.

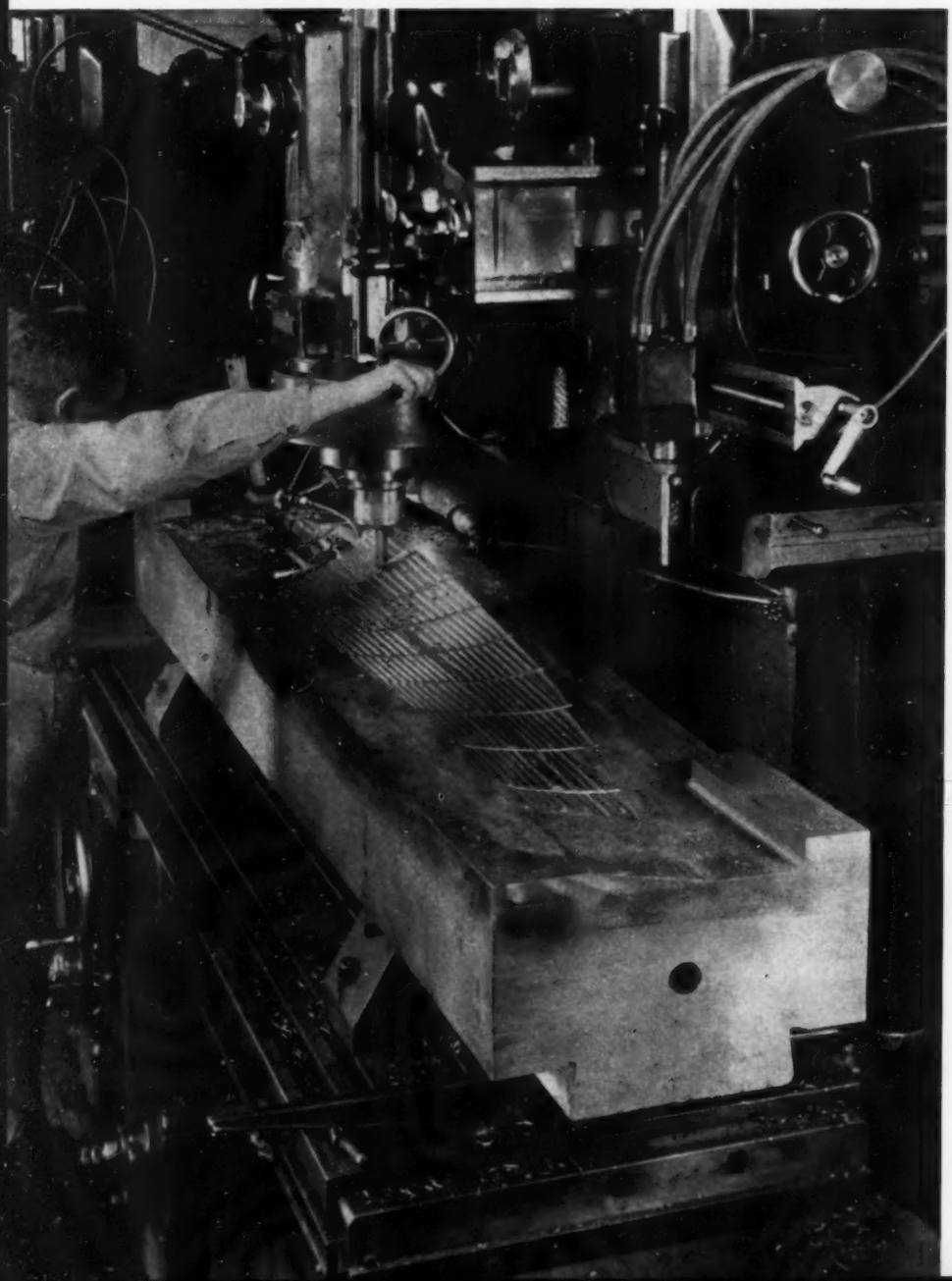
Forging is usually done from 750 to 840 F. on drop hammers, but can be somewhat higher in upsetters and in forging presses where the impact is less. Temperatures as low as this cannot be judged by appearance, as can the forging temperatures for steel. It is essential, therefore, to employ pyrometers and preferably to have the furnaces arranged for automatic temperature control.

In plants where forging is done by the Aluminum Company of America and where the particulars here given were obtained, much of the heating, especially of large forgings, is done in continuous furnaces and in all of them temperature control is automatically maintained. The temperature depends upon such factors as alloy used, type of stock, type of die and character of equipment used for forging.



A cast aluminum billet is handled by a manipulator as it is broken down to a forging billet in this 3,000 ton press

Roughing out half of a forging die for making an aluminum propeller blade



Shrinkage in length or width caused by cooling requires a tolerance of plus 0.004, minus 0.002 in. per inch. Thus, for a 6 in. dimension the tolerances would be plus 0.024, minus 0.012 in. The mismatch tolerance is about 0.015 in. for a 2½-lb. forging and increases up to 0.032 in. for a 25-lb. forging.

The draft for drop forgings is nominally 7 deg., ±1 deg. for outside dimensions and also inside of holes or depressions, but as much more draft as conditions permit may be added. On upset forgings, the nominal draft is 1 deg., ±½ deg.

Allowance for Machining

Thickness tolerances on forgings up to ½ lb. in weight are minus 0.010, plus 0.032 in. As weight increases, the thickness tolerance increases until for forgings 24 lb. and over it becomes minus 0.032, plus 0.093 in. Allowance for machining is usually $\frac{1}{16}$ in. for small and medium forgings and $\frac{1}{8}$ in. on large forgings.

The minimum radius on an outside corner is $\frac{1}{16}$ in. on forgings up to 1 in. cavity depth and should be increased to $\frac{3}{16}$ in. minimum for a cavity depth of 2 to 3 in. Inside or fillet radii are preferably made as large as conditions permit, with the minimum about $\frac{5}{16}$ in. when the die member is up to $\frac{5}{16}$ in. deep. As the depth increases, the radii should be increased and should be not less than a fourth the depth when the metal is not confined or not less than half the depth when the metal is confined. Holes formed by a male part of the die should not have a depth exceeding two thirds the diameter. Dies should be highly polished and should be kept well lubri-

Three aluminum forgings which form the crankcase for a fourteen-cylinder Pratt & Whitney radial aircraft engine

cated to obtain satisfactory results.

In making any die the specified details of the piece required have to be kept in mind. The foregoing recommendations are indicative of common practice and difficulties are likely to be encountered when drawings call for departures from them.

Stock employed for aluminum forgings is usually rolled or extruded and sheared to the length required. Large forgings sometimes start with a cast billet which is worked or broken down to forging size in large presses of 1,500 or 3,000 ton capacity. In forging the blank for an aircraft propeller, for example, a 26-in. length may be cut from a 12 x 12 in. billet having rounded corners. This is heated in a gas-fired furnace in which it passes through four heat zones until it reaches a temperature of 700 F. It is then removed and, while handled by a manipulator, is forged in the press, using as many squeezes as required, until the section is about 7 in. square. Any cracks or checks which appear, especially at the corners, are chipped out.

Control of Dimensions

After reheating, the piece is forged into an octagonal section about 5¼ in. across the flats, while shifted as required by a manipulator. This is done on a flat anvil about 11 in. wide (parallel to the axis of the piece) and using a flat hammer with a 4-in. radius at its edges, so that the metal will not be torn. The press stroke is controlled by an operator beside an indicator which shows the dimension between hammer and anvil. By careful control the operator holds dimensions across the flats of the forging within ±⅛ in. The blank formed in this case is 120 to 130 in. long and is more nearly uniform throughout its section than if rolled to the same section.

Forgings for crankcases of aircraft engines are made in similar fashion. A billet of 19 in. square section and weighing 1,500 lb. is used for certain forging blanks of this type. It is forged into a 13 in. octagonal billet from which lengths are sawed. These lengths are heated and flattened to form blanks called "pancakes," which are later drop forged into the approximate shape of the crankcase section required.

Piston forgings are made from bar stock which is cut into billets on an abrasive cutoff wheel, as this gives a smoother cut than a saw. A typical blank is about 4½ in. in diameter and 10 in. long. A ½-in. hole is drilled in one end of the blank, to serve as a tong hold, and then the blank goes to a gas-fired furnace where it is heated to 780 to 840 F. From the furnace the blank goes to an upsetter where it is held in one cavity of the side opening dies while the ram advances and does the initial upsetting. This increases the diameter and forms a bevel at the end which later becomes the piston head. Flash is trimmed from the blank, which is then dipped in a caustic soda etching solution, is inspected and is then reheated.

The blank is inserted in the second cavity of the upsetting die and is struck by a ram die which forms the recess and expands the forging into the holder die. Bosses for piston pins are formed in this operation, and the head is given the required shape both inside and outside. After the flash is removed by shearing, some pistons are subjected to cold coining in a hydraulic press. This expands the piston a few thousandths of an inch and sizes it more accurately.

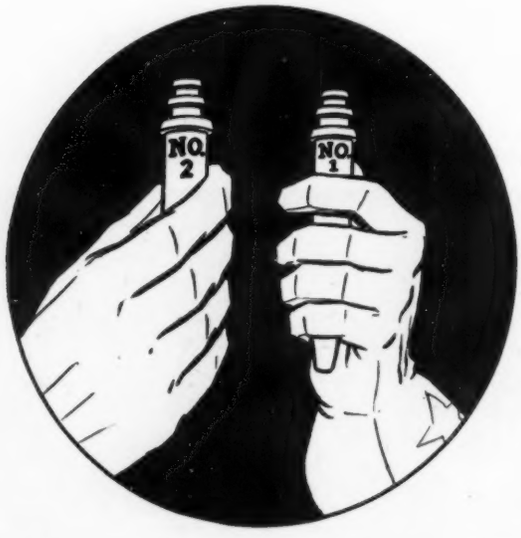
A second article on "Forging Aluminum Alloys" will appear in an early issue.

A propeller blade is removed from the forging die. The die surfaces are polished and oiled for better finish and longer life

Are You Wasting Oxygen?

DEMAND for oxygen and acetylene gases for welding and cutting operations has increased enormously in recent months. More and more companies are finding their requirements for these gases being multiplied many times over as they step up in their war production activities. Ship construction is a good case in point. Today about 28 percent of the merchant ships under construction are of all-welded design—and this percentage is steadily expanding.

It is almost inevitable that in this rapid expansion of oxyacetylene welding and cutting, there should be a period when wasteful practices are prevalent. The wholesale addition of thousands of inexperienced operators has considerably aggravated this condition. Any savings that can be made in the use of these gases will help all concerned in preventing a serious oxygen supply situation from becoming critical. The following recommended practices are the result of a survey made by Air Reduction Sales Company engineers and should be helpful in eliminating "insignificant" losses and will prove economical to the individual shop where such conditions prevail.



Use the proper size torch tip. An oversize tip wastes gas. Check size with drill if number is not clear

Do not use excessive pressures. Keep a pressure chart handy—and use it. When speed is desired, change tip

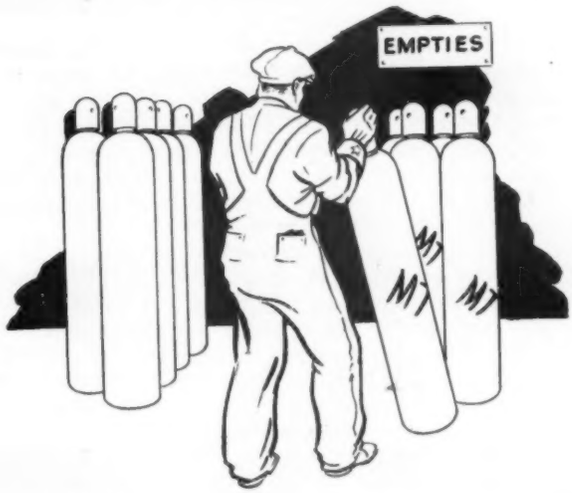
Close cylinder valves when torch is not in use. Between jobs, release regulator screw to prevent leakage

Check hose periodically for leaks. Dip in water while under pressure. Use soap-water on connections

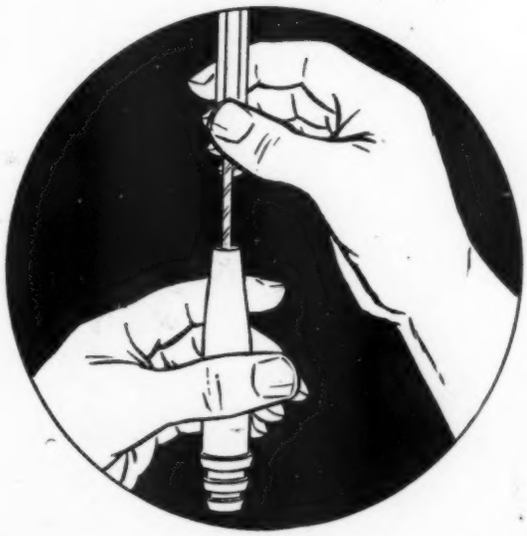
Long hose requires more pressure. Use short lengths of correct diameter hose. Small hose promotes leakage

Keep inventories low; return empties promptly—others may need them. Idle cylinders serve no purpose

Don't let torches burn unused. Three minutes out of each hour means a 5 percent loss. Don't heat air



Use all the gas in each cylinder before connecting a new one. Often time can be saved by manifolding



Keep tips clean and free from carbon and slag. Congested tips are inefficient. Use cleaning drills

Don't mistreat hose. Keep it clear of sparks and slag. Burns promote leaks—and rubber must be conserved

Inspecting Bolts, Nuts and Screws

1. Material is received in the form of wire in coils with identifying tags giving data as to order number and the heat from which the material was produced at the mill. The first inspection is one which makes sure that size is within the required limits and that the composition is approximately correct by making a spark test with a small portable grinding wheel. If these tests are passed samples are taken and sent to the chemical and metallurgical laboratory for a check on analysis and for micro-examination

ANY MISTAKEN impression that bolts, nuts and screws are "run of the mill" products needs correction. In the Lamson & Sessions Company plants, where the pictures on these pages were taken, advanced production and inspection methods are used.

Cold heading is the predominant operation by which the products in question are manufactured, although it is supplemented by machining operations when they are needed. Cold heading is done with such precision that aircraft bolts and screws are made and held within the close limits required for such work.

After material tests have been made, each batch is identified with a tag carrying the heat number, the grade of steel and the size. This tag follows the material through all operations. When heat-treatment is required, data on hardness and other physical properties are included.

When a new product or one involving new dies goes into production, some of the first few parts are delivered to an inspection layout department for a careful inspection. This is in addition to the regular line inspection which is made at the machine.

Ordinary commercial bolts do not require the exacting inspection used on aircraft bolts, but a certain percentage is inspected, and if defects exceed the allowable limit the batch receives 100 percent inspection.

Aircraft bolts, nuts and screws receive 100 percent visual and 10 percent dimensional inspection. In addition 2 percent undergo testing for physical properties, in the course of which the bolt is destroyed.

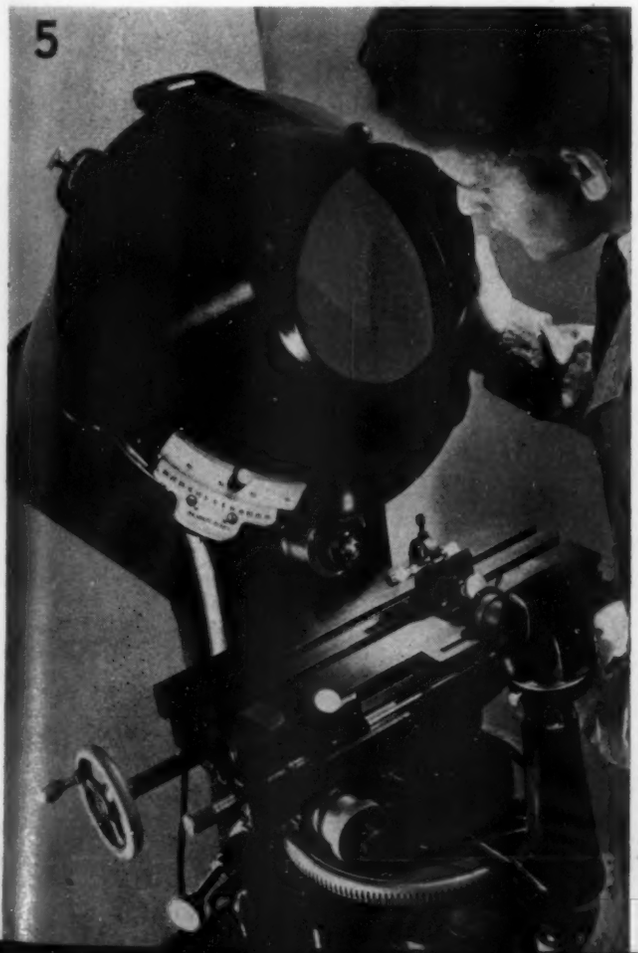
Special attention is given to good lighting for inspection and to providing equipment which facilitates the work.

4. Line inspection at the boltmaker is shown in the illustration below. The gages themselves are checked daily or weekly, depending on the volume of production. For this purpose, gages go to a master inspection department equipped with Johansson gage blocks, Pratt and Whitney super-micrometer which measures within 0.00001 in., master rolls which have an accuracy of 0.000004 in., master thread gages and such other equipment as is needed

2. Spectroscopic analysis is made of material. This provides a rapid test for the presence of impurities which may be present. Microscopic equipment is employed for check on grain structure, possible decarburization, internal segregation and non-metallic inclusions. Physical tests include bending around a mandrel and a compression test

3. Cold heading is done after material has passed the preliminary tests. When a new run, involving a new set-up of dies, is made the first few parts are given a careful check on critical dimensions by line inspectors who have charge of a given number of machines. As the run proceeds the product receives a similar check regularly. In addition the machine operator has limit gages which he uses periodically as the run is in progress

5. Precision threads are essential in some instances especially for aircraft blots. This Jones and Lamson thread comparitor is used in such cases. For ordinary external and tapped threads there are thread and plug gages. Whatever additional tests are needed are made during subsequent operations



6. A magnetic test for flaws is made in a special machine designed for this purpose. The piece is flooded with a light oil containing a ferro-mangnetic material in finely powdered form. The powder will collect at any point where flaws exist. The bolt is clamped between heads by cams. Cams also control the flow of oil and close the electrical switch. Current is usually 3,000 amp.

CONTINUED ON NEXT PAGE

Inspecting Bolts, Nuts and Screws CONTINUED

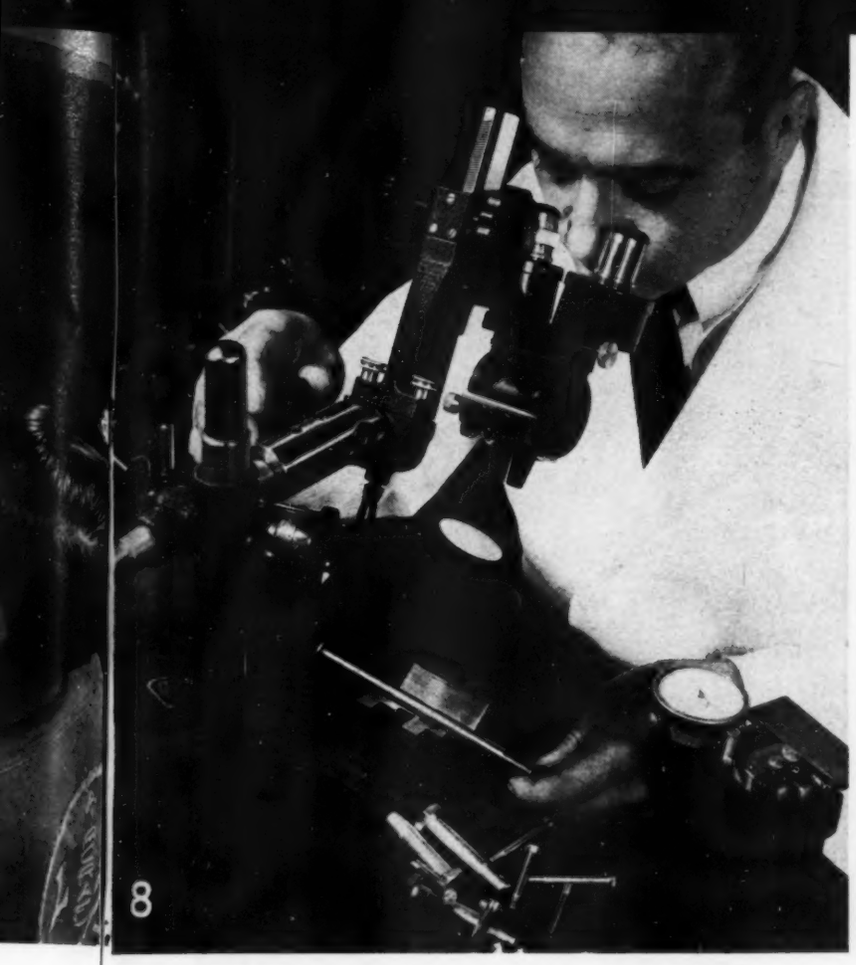
7. Hardness tests are made on many bolts following heat treatment. The Rockwell tester shown at right is motorized. The minor load is applied by hand, the major load by power. If close hardness limits are specified the surface is first ground flat. The machine is checked twice daily against a master disk

8. Microscopic inspection of surface condition is required on some bolts and screws, especially for aircraft work. Bench inspection equipment is used, as illustrated at right center, but high magnification is not essential. Inspection is made to check bolts and screws for freedom from fine scratches

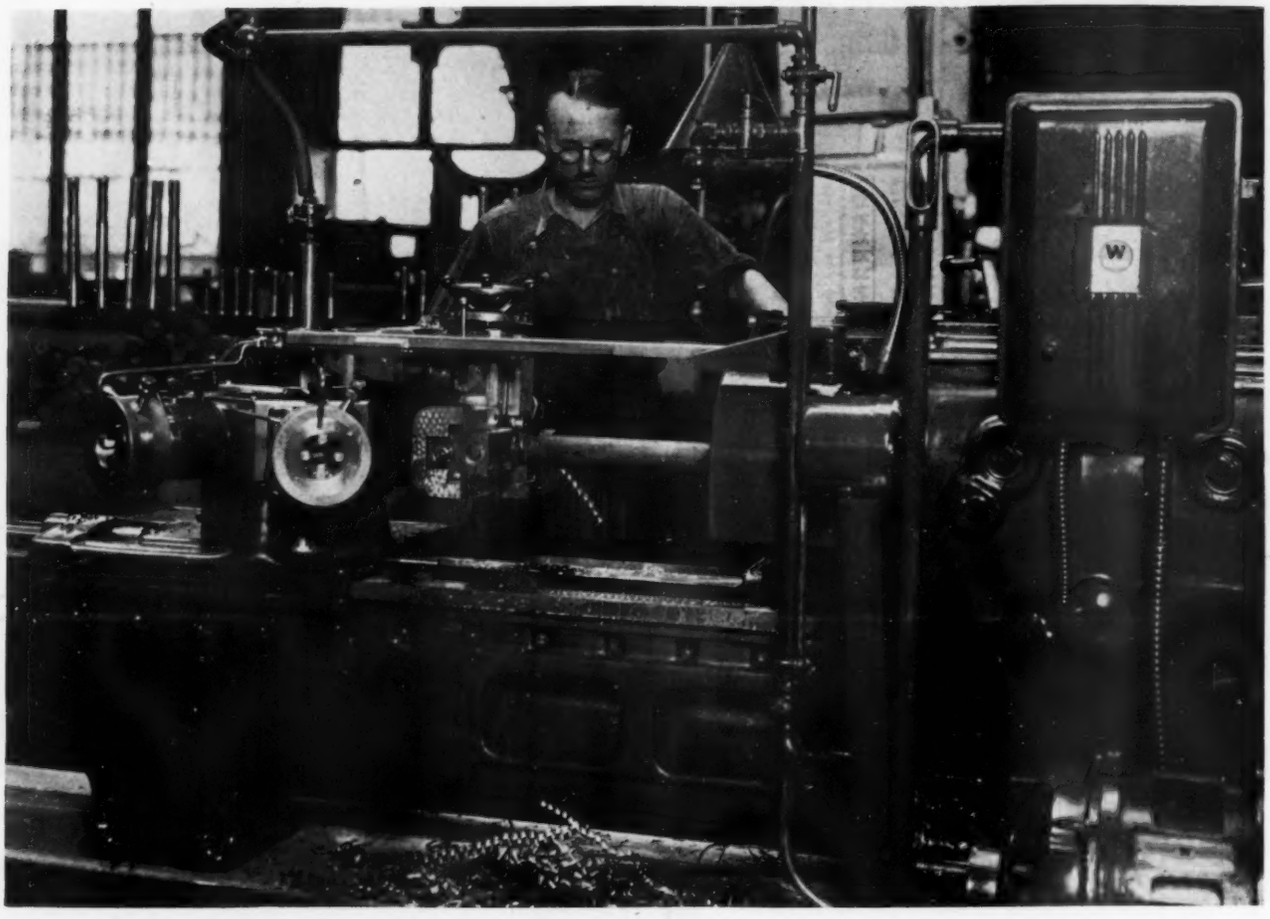
9. Completed parts are placed in tote pans on a gravity conveyor which delivers them to the final inspection department. Each batch passes first to an inspector, far right, who checks a certain percentage of the parts. If defects exceed an allowable figure the entire batch goes to inspection benches

10. Slowly moving belts are used for sorting and inspecting nuts when specifications do not require more exacting tests. Commercial bolts and screws receive similar rapid inspection. If those tested do not meet specifications then the entire batch receives detailed tests and defective parts are scrapped

11. Aircraft bolts and screws are inspected on ordinary flat top benches, shown below, at which the girl inspectors sit. They take bolts from a pile in front of them and make a visual inspection for defects, especially in threads. Ten percent of a batch are checked with go and no-go gages; if they do not pass inspection the entire batch is checked



12. Aircraft nuts are inspected in the set-up illustrated at lower right. The nuts feed from a hopper down onto a narrow glass plate. Below the clear glass is a mirror in which the lower face of the nut can be seen. Visual inspection of both sides of 2,000 nuts an hour is possible



Gisholt turret lathes equipped with special tools and taper turning attachment machine frame bolts in record time

Locomotive Bolts Machined Quickly

BY J. E. CARROLL, TOOL SUPERVISOR, SOUTHERN RAILWAY SYSTEM

Over 200 frame bolts made in 8 hr. on turret lathe with taper turning attachment and box tool. They are machined in one set-up

TAPERED BOLTS needed for locomotive repairs in the major shops of the Southern Railway are made on Gisholt 1L turret lathes equipped with tools and taper-turning attachment designed especially for this work. All bolts are made up as needed to individual specifications, each bolt being completed in a single operation. No preliminary centering operations are necessary. The turrets carry all tooling required for turning the tapered body of the bolt, for straight turning and threading the end, and for chamfering, facing and cutting off the end.

Preparatory to fitting the bolts, holes in the locomotive frame need not be reamed to arbitrary dimensions, but merely enough to provide a round true hole through the mating frame members. Therefore, there is not loss from unnecessary reaming and not great expense involved for many special reamers or special tool maintenance; however, the reamers must be kept sharp and ground to the correct taper of $\frac{1}{16}$ in. per ft.

After the reaming operation, each hole is measured with the illustrated plug gage which gives a direct reading of the large diameter of the hole. This diameter and other essential data are tabulated on a shop-order form and sent to the lathe operator. The bolt can then be turned on the turret lathe in one set-up from either bar stock or an individual forging.

A few years ago these tapered frame bolts were machined on engine lathes, setting the taper by adjusting the tailstock. Normally it would take from 15 to 30 min. to fit a tapered bolt in this manner. This method was discarded in favor of the Gisholt installation.

Today the largest frame bolt can be machined in about 2 min. One operator recently turned out 200 $1\frac{1}{4}$x2-in. bolts in an 8-hr. shift.

Holes in the frame and mating members are reamed to provide a true round hole. A tapered plug gage gives the diameter at the large end of the hole. The lathe operator does not go to the erecting floor to check dimensions

SHOP-ORDER FOR TAPERED BOLTS

Date 5-5-42

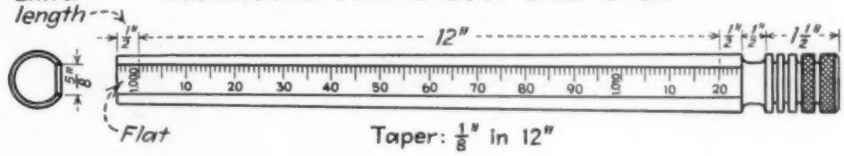
ENGINE NUMBER 260 CHARGE ACCOUNT 308-C

Number of Gauge	Size of Gauge	Length of Hole	Diameter Of Thread	Single Nut	Nut and Grip	Single Castle	Round Head	Length of Head	Diameter of Head	Bolts Needed
D	1	7 3/16	1 1/4	X						1
B	3	3 3/16	1 1/8			X				3
B	5	3 1/8	1 1/8			X				3
E	6	7 1/4	1 1/4	X						1
D	8	7 1/2	1 1/4	X						1
B	3	4 3/16	1 1/8	X						1
B	8	1 3/8	1 1/8			X				3
A	1	2 7/8	1			X				1

After reaming the hole in the locomotive frame, the erecting floor machinist records on this shop-order form the size and number of plug gage used, the length of bolt required, and the type of nut desired. From these data the lathe operator can machine the bolt

Plug gages with 1/8 in. taper per ft. and available in sizes shown in the accompanying table are used to record dimensions of the reamed holes. These gages eliminate excessive expense necessary if reamers had to be maintained to exacting dimensions

LOCOMOTIVE FRAME BOLT SIZE GAGE



PLUG GAGE CLASSIFICATION AND LIMITS

Gage No.	Gage limits A	B	C	D	E	F	G	H	I	J	K	L
10	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	1.2500	2.3750	2.5000
9	1.1125	1.2375	1.3625	1.4875	1.6125	1.7375	1.8625	1.9875	2.1125	2.2375	2.3625	2.4875
8	1.1000	1.2250	1.3500	1.4750	1.6000	1.7250	1.8500	1.9750	2.1000	2.2250	2.3500	2.4750
7	1.0875	1.2125	1.3375	1.4625	1.5875	1.7125	1.8375	1.9625	2.0875	2.2125	2.3375	2.4625
6	1.0750	1.2000	1.3250	1.4500	1.5750	1.7000	1.8250	1.9500	2.0750	2.2000	2.3250	2.4500
5	1.0625	1.1875	1.3125	1.4375	1.5625	1.6875	1.8125	1.9375	2.0625	2.1875	2.3125	2.4375
4	1.0500	1.1750	1.3000	1.4250	1.5500	1.6750	1.8000	1.9250	2.0500	2.1750	2.3000	2.4250
3	1.0375	1.1625	1.2875	1.4125	1.5375	1.6625	1.7875	1.9125	2.0375	2.1625	2.2875	2.4125
2	1.0250	1.1500	1.2750	1.4000	1.5250	1.6500	1.7750	1.9000	2.0250	2.1500	2.2750	2.4000
1	1.0125	1.1375	1.2625	1.3875	1.5125	1.6375	1.7625	1.8875	2.0125	2.1375	2.2625	2.3875
0	1.0000	1.1250	1.2500	1.3750	1.5000	1.6250	1.7500	1.8750	2.0000	2.1250	2.2500	2.3750

Use of Rotary Head Milling Machine

BY H. A. FROMMELT, DIRECTOR OF INDUSTRIAL RESEARCH, KEARNEY & TRECKER CORPORATION

Grooves in radial cams machined without using templets, cam slide or dividing head. The cutter is located by the machine

THE JOB OF MILLING a cam without benefit of a dummy templet but with an economy in time and a high standard of accuracy is a golden objective. A method for the milling of radial or plate cams, which will bring this objective within easy reach, will now be outlined.

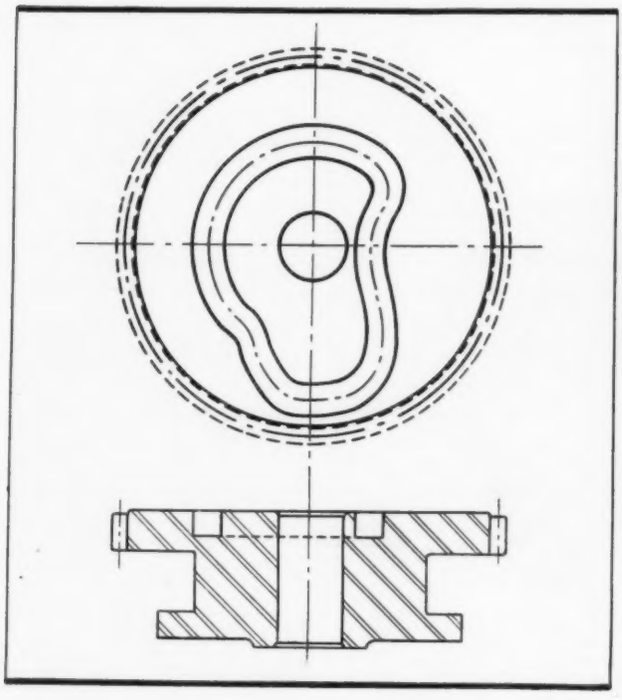
Fig. 25 indicates that this is no idle statement. The equipment necessary for the work includes the rotary head tool and die milling machine with a rotary table shown in Fig. 26. A master cam can be milled in hardly more time than is required to mill a cam using a templet and such essential equipment as a cam slide and roller brackets.

In order to describe this operation, the principle of the rotary head machine must be explained. As is evident from Fig. 26 this milling machine resembles in some respects a vertical milling machine. The spindle holds the cutter in a vertical position and the workpiece is brought to the cutter in much the same fashion as on a standard vertical miller. But beyond this the similarity ends.

The rotary head, which is the revolutionary departure in this machine tool, can be revolved by hand or power. The rotary head periphery, graduated in degrees, is used to measure this movement which can be controlled accurately and definitely by trip dogs. The directional control lever controls the rotation of this rotary head which moves clockwise when the lever is thrown away from the operator, and counterclockwise when the lever is engaged in a forward position. The rotary head handwheel with its graduated dial is used to make final settings.

The cross-slide carries the spindle of this milling machine. The spindle can be offset a maximum of 4 in. by moving the cross-slide to the extreme right of its travel. In other words, with the spindle offset 4 in. from the center of the rotary head, a circle of 8 in. diameter can be milled since the entire head revolves while the spindle carrying the cutter has its own independent motion.

Hence, the milling of a plate cam with a groove composed of a series of tangent arcs becomes a simple operation when the rotary head machine is used. The center of the rotary head can be set over each arc composing the cam groove, and the cross-slide can be offset an amount equal to the radius of the arc minus the radius of the cutter.



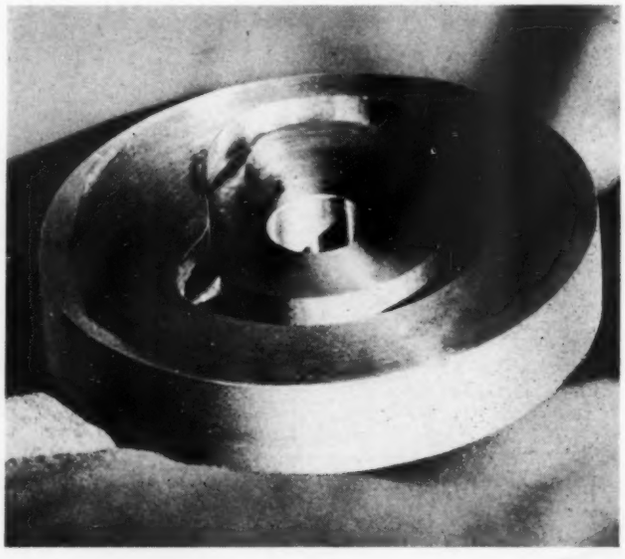


Fig. 25—This master cam was cut on the rotary head milling machine in 8 hr. and held to ± 0.001-in. tolerance. All radii are tangent. No filing was required to finish the cam

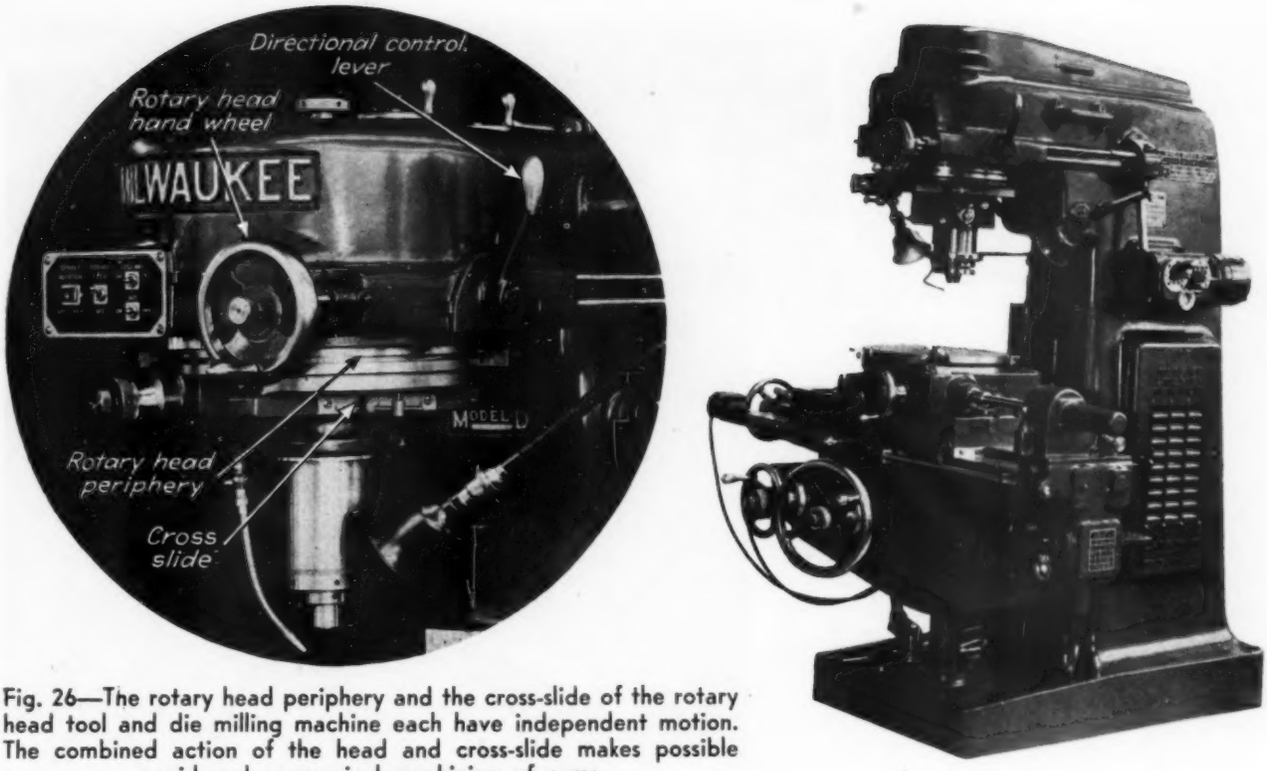


Fig. 26—The rotary head periphery and the cross-slide of the rotary head tool and die milling machine each have independent motion. The combined action of the head and cross-slide makes possible rapid and economical machining of cams

The rotary head can then be set to revolve through the number of degrees subtended by the arc while the end mill machines the cam groove.

The customary set-up employed with the rotary head milling machine is shown in Fig. 27. Here a plate cam is being milled. This design calls for a cam groove on both sides. The reverse of the one in the machine is shown in the foreground of the illustration.

The blank is mounted on a rotary table and clamped. In order to describe the necessary steps, reference will be made to Fig. 28, which is a reproduction of the cam shown in Fig. 25.

The center of the rotary head is brought over the center of the cam blanket at *O*, which is not only the center of the blank but also of curve *A* that subtends an angle of 120 deg. In order to mill this portion of the cam groove, it is only necessary to offset the spindle by moving the cross-slide an amount equal to the radius of arc *A* minus the radius of the cutter. The end mill is sunk to the required depth at the left end of arc *A*. The dogs are now set on the rotary head periphery so that the rotary head will revolve through the necessary 120 deg. when the power feed is engaged.

The cam groove is completed in its width by offsetting the spindle first to the outside arc of the groove, then to the inside arc. For the first setting, the amount equals the radius of the arc

Fig. 27—Plate or radial cams can be cut readily on the rotary head milling machine. Once the cam blank is located, the grooves are machined by positioning the cutter with precision screws and graduated dials

minus the radius of the cutter; for the second setting it is equal to the radius of the arc plus the radius of the cutter. In each of these operations a few thousandths of an inch are left for finishing.

Arc *E* is milled next. The milling machine table is moved longitudinally and transversely by means of precision screws and graduated dials (in thousandths of an inch) so that the center of the rotary head coincides with the new center at *e*. No changes in the set-up of the workpiece are necessary; nor is the taking of measurements. All operations are completed by working from the main center *O* and moving the table as indicated until the rotary head center rests over the center from which the new operations will proceed.

It should be noted here that after the first arc *A* is milled, the cross-slide is brought back to zero. A scale on the cross-slide graduated in tenths of an inch, used in conjunction with a dial graduated in thousandths, makes accurate setting possible. The machine is then ready for the next operation.

As stated previously, after arc *A* is milled, the table is moved until the center of the rotary head coincides with the center at *e*. The distance of *e* from the horizontal and vertical center lines is known; hence, the table can be moved by means of precision screws exactly to the new center.

Again the milling of arc *E* is simply and quickly accomplished by offsetting the spindle, or cross-slide, an amount equal to the radius of the outer arc *E* minus the radius of the cutter. At the same setting, the inner arc is milled but with the cross-slide offset an amount equal to the inner radius of the arc plus the radius of the cutter.

Arc *D* is milled by setting the center of the rotary head over the center *d*.

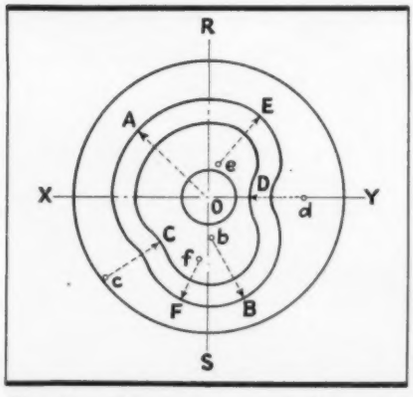


Fig. 28—This diagrammatic layout of the cam shown in Fig. 25 indicates where the center of the cross-slide spindle is located for machining the various arcs of the cam groove

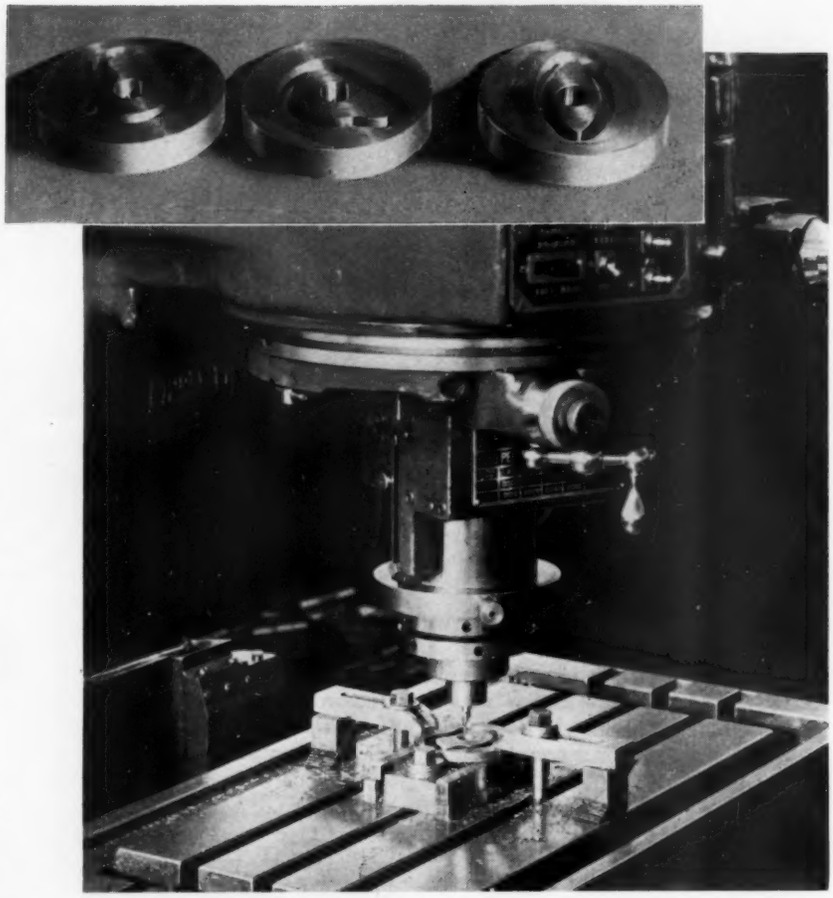


Fig. 29—Here are typical cams which have been machined on the rotary head milling machine. When grooves of radial or plate cams can be laid out on paper with respect to centers and angles, this miller can cut the cam

The same procedure is followed for arcs *B* and *C*.

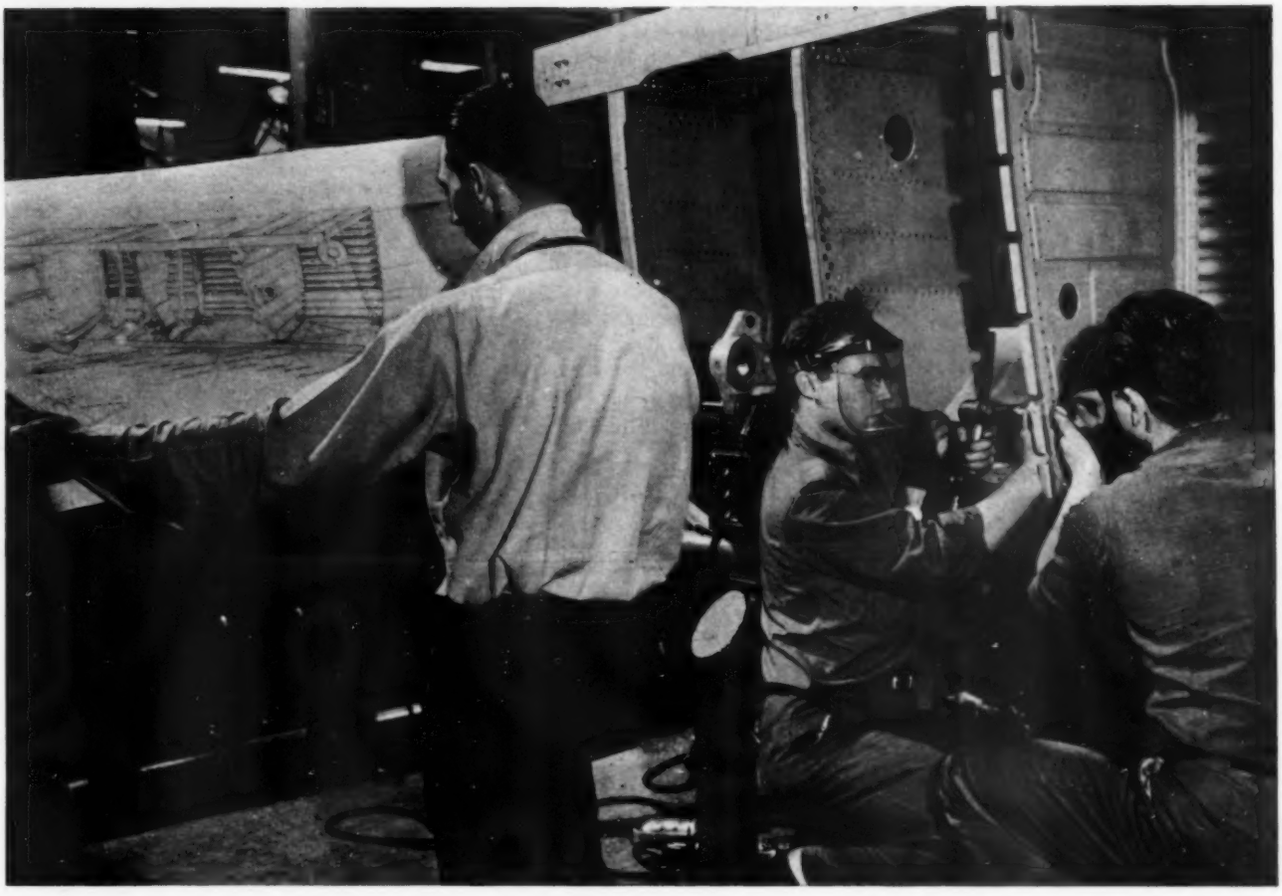
Straight lines such as those connecting arcs *C* and *F* are milled as easily and accurately as are the arcs previously referred to. The angle which lines *C-F* make with the horizontal center line is known; in this instance, 60 deg. The rotary head is set to this angle by means of the graduated periphery and the dial of the rotary head handwheel which permits a setting in minutes. The cross-slide is now fed along this arc, making it tangent to arcs *B* and *F*.

No change in set-up has been necessary between any of these operations. The set-up made at the beginning suffices throughout the entire milling of this cam. Moreover, no measurements have been taken—all settings of the table or head, necessary for positioning the cutter properly, have been made by precision screws and graduated dials. All movements are made with reference to the center lines *X-Y* and *R-S* used as datum lines. The distance of the various arc centers, such as *A, B, C, D, E* and *F* from *X-Y* and *R-S* are given. Likewise, such angles as straight lines *C-F* make with either the vertical or horizontal center lines, namely *X-Y* and *R-S*, are also given.

The cam shown in Figs. 25 and 28 was milled in 8 hr. from the solid blank to a tolerance of ± 0.001 in. And what is equally interesting no hand operations such as filing were required to complete the job.

Fig. 29 shows additional cams produced on the rotary head milling machine. At no time was a layout necessary in milling these cams. Operations were started by centering the blanks with the center of the rotary head. After that all positionings of the cutter were accomplished by movements of the table or head. And these were made by the use of precision screws and graduated dials.

Whenever the arcs and straight lines making up a cam groove of a plate or face cam can be laid out on paper with respect to centers and angles, the rotary head tool and die milling machine can complete the milling accurately and economically. This is particularly true when a dummy templet and cam slide are not available for duplicating cams from a master.



Assembly operations in the aircraft industry are simplified by the use of three-dimensional drawings. Known as production illustrations, they include only necessary assembly information and present it clearly

Three-Dimensional Views Boost Plane Production

A MAJOR DIFFICULTY in training unskilled workers for assembly-line operations has been the reading of blueprints. Advanced blueprint reading requires training, and practice. A new man without this skill, or with only an elementary knowledge, may spend hours in attempting to decipher an involved design. If he asks for help his foreman may understand the print himself, but lack the ability to convey this understanding to the worker by word pictures.

A solution to this problem first introduced in 1939 has worked with such success that it is now used in a number of aircraft plants and is under consideration by the Training Within Industry branch of the War Production Board. Blueprints are eliminated in assembly line operations, and their place is taken by isometric, or three-dimensional drawings, known as production illustrations.

These sketches are broken down into essentials so that a given drawing depicts only information needed for a given series of operations. Since the parts to be assembled are preformed, there is no necessity to clutter up the drawing with dimensions and details.

In their early stages, the drawings were used by the Douglas Aircraft Company as sales illustrations for visualizing planes to prospective buyers. When the war brought extensive orders from England and France, mass production of Douglas military planes became a possibility, and the introduction of thousands of untrained workers became a problem.

Starting with a staff of four artistically-inclined engineers, George Tharratt built up a production illustration department. They drew sketches of

production-line proposals. Ideas for special equipment, new tools, and new methods of manufacture were passed from department to department in picture rather than word-description form.

It was found that a proposal needing approval could be explained verbally to an illustrator who would sketch and resketch it until the originator's ideas were accurately conveyed. An idea presented in isometric-sketch form permitted the proper authority to pass on its merits quickly and intelligently. If found to be suitable the idea was ready for the engineering department to plan construction in detail.

The next step was to apply the sketches to actual production, using them to explain in simple form the assembly operations to be performed. In one plant a test was made to determine their value, and two crews, one with an illustrated sketch, and one without, were assigned to assemble left- and right-hand wing spars respectively. The crew working with the sketch completed the first unit in 1.9 hours while the crew working without the sketch required 5.4 hours. Similar savings were found in the inspection department.

Blueprint difficulties are greatly magnified in electrical and plumbing installations. To search through many engineering electrical prints to find needed installation data is a slow and laborious task. For such work, sketches which present only the necessary material are particularly valuable.

By including jig and tool requirements on the illustration, more time is saved. The line employee, whether new on the job, filling a working position that has been changed, or to which he has been temporarily assigned, does not have to experiment or interrupt the work of others in order to learn what tools to use.

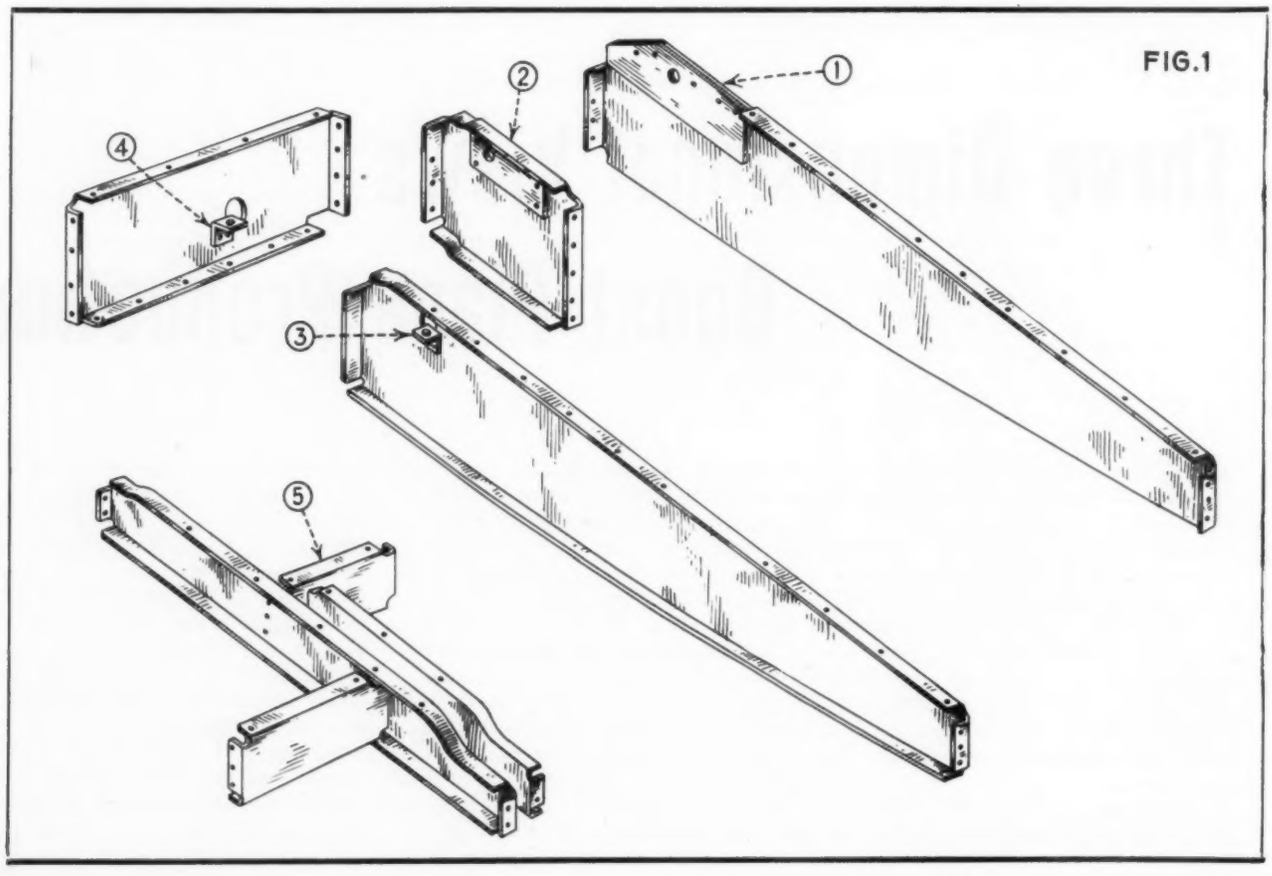
These Assembly Drawings for a Bombardier's Door Illustrate the Technique

An enlightening comparison can be made by following through the assembly drawings for a bombardier's lower door and comparing the ease with which the sequence of operations is understood with the difficulty that would be encountered in trying to pick the same information out of the blueprints of the parts involved.

Fig. 1 of this series depicts five assembly operations each joining two or more preformed parts. Each numbered arrow indicates one of these operations. In actual practice the sketch would have listed alongside the number and name of each part required in each of the operations.

The frame is riveted together in the manner shown in Fig. 2 of the series. At first glance this may appear to be a complicated assembly to present to an inexperienced man with a single drawing, but each part can be clearly identified and the sequence of riveting the frame together is given by the circled numbers. Assembly begins with the four rivets at (1) and continues through operation (31). A note explains that at stations (16), (17), (18), and (19) only top and bottom rivets are inserted. After operation (31) the middle flush rivets are inserted. One rivet is omitted at stations (24), (28), (9), (7), (20). The reason for these two variations becomes evident in the next drawing.

In Fig. 3 six additional assembly operations are performed. When necessary, parts are drawn out of position and arrows used to indicate the method of placing them. Angle ribs are riveted into position where rivets were omitted or flush rivets used in the preceding sketch. In one operation the skin is riveted in place.



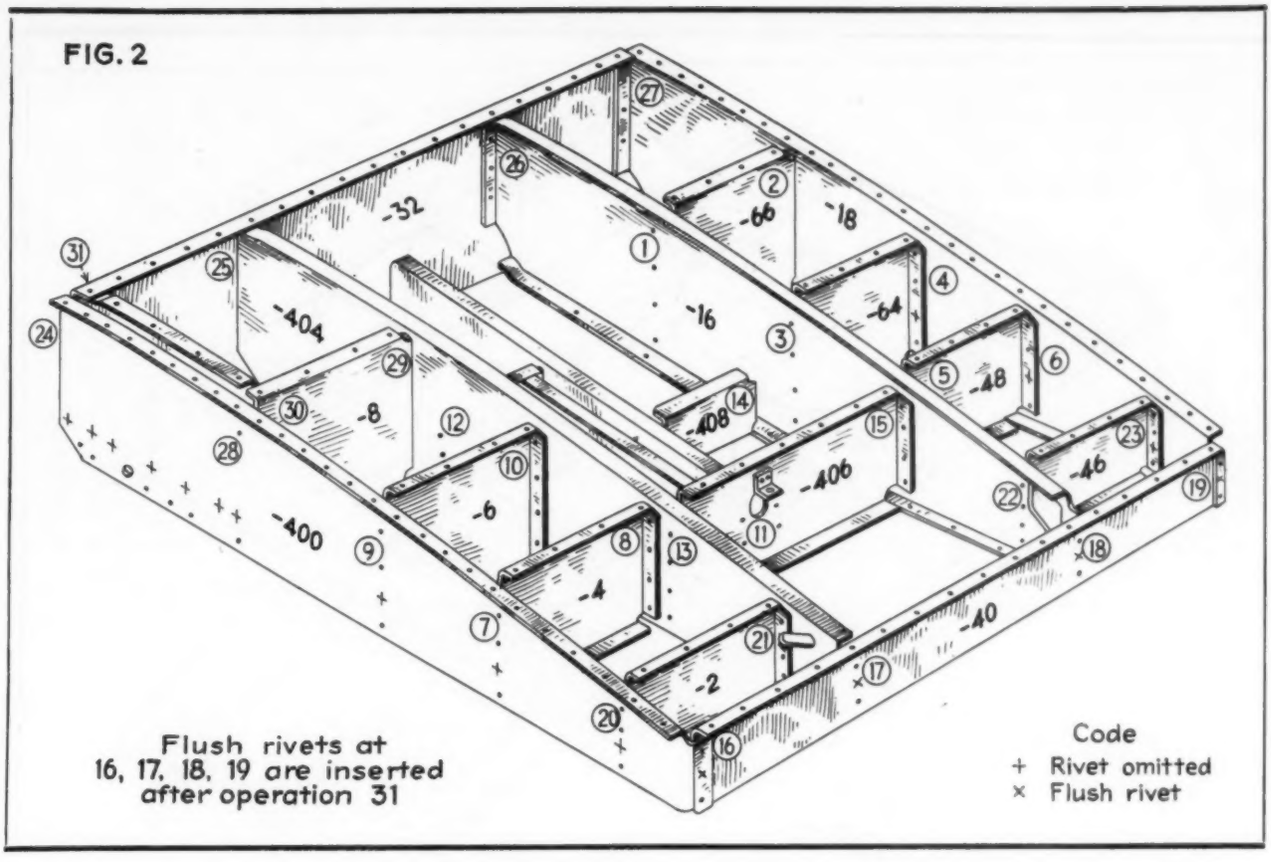


Fig. 4 (*next page*) shows the door inverted so that it rests on the skin side. In this position the emergency pull handle mechanism is installed. Enlarged detail views of this mechanism are given at *A* and *B*. After installation of this mechanism the top cover plate shown in view *C* is assembled and attached to the door to complete the assembly. Order of operations again is indicated by circled numbers.

From this example it can be seen that complex designs and blueprints which are bewildering to the uninitiated are translated into simple isometric drawings which contain only information relative to particular assembly operations. (*Continued on page* 509)

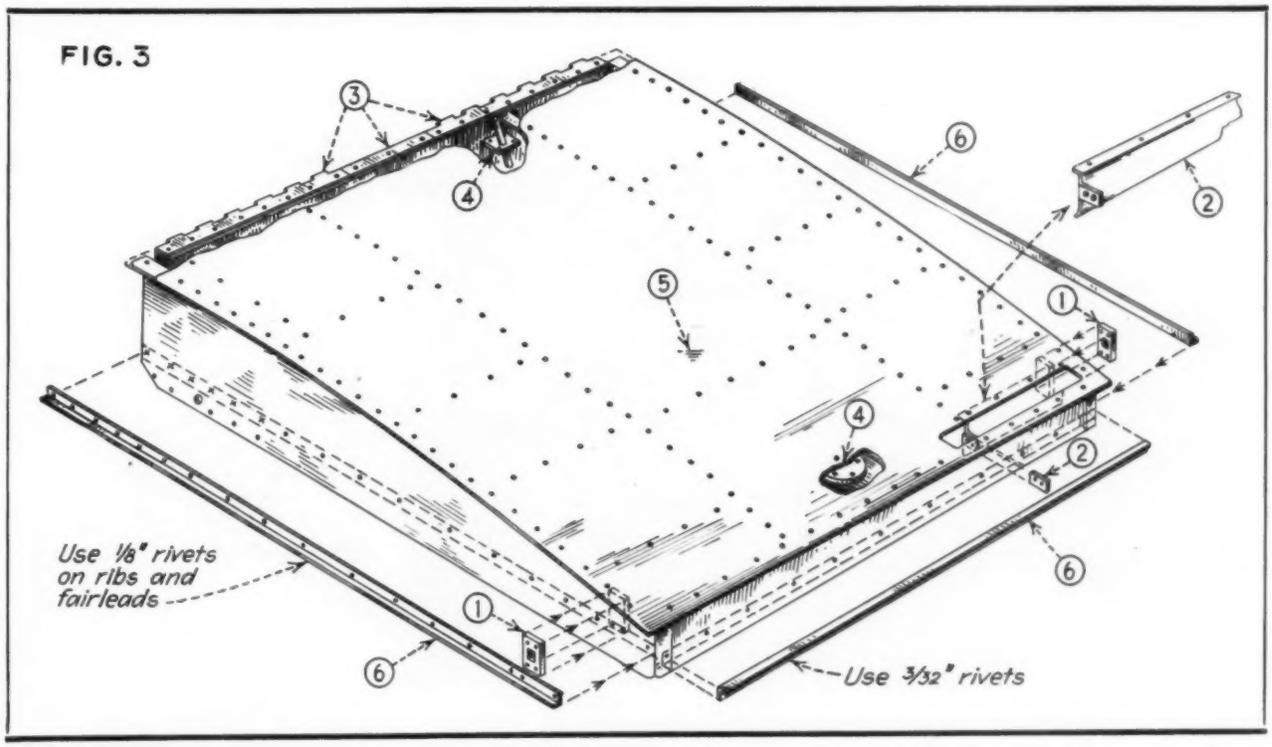
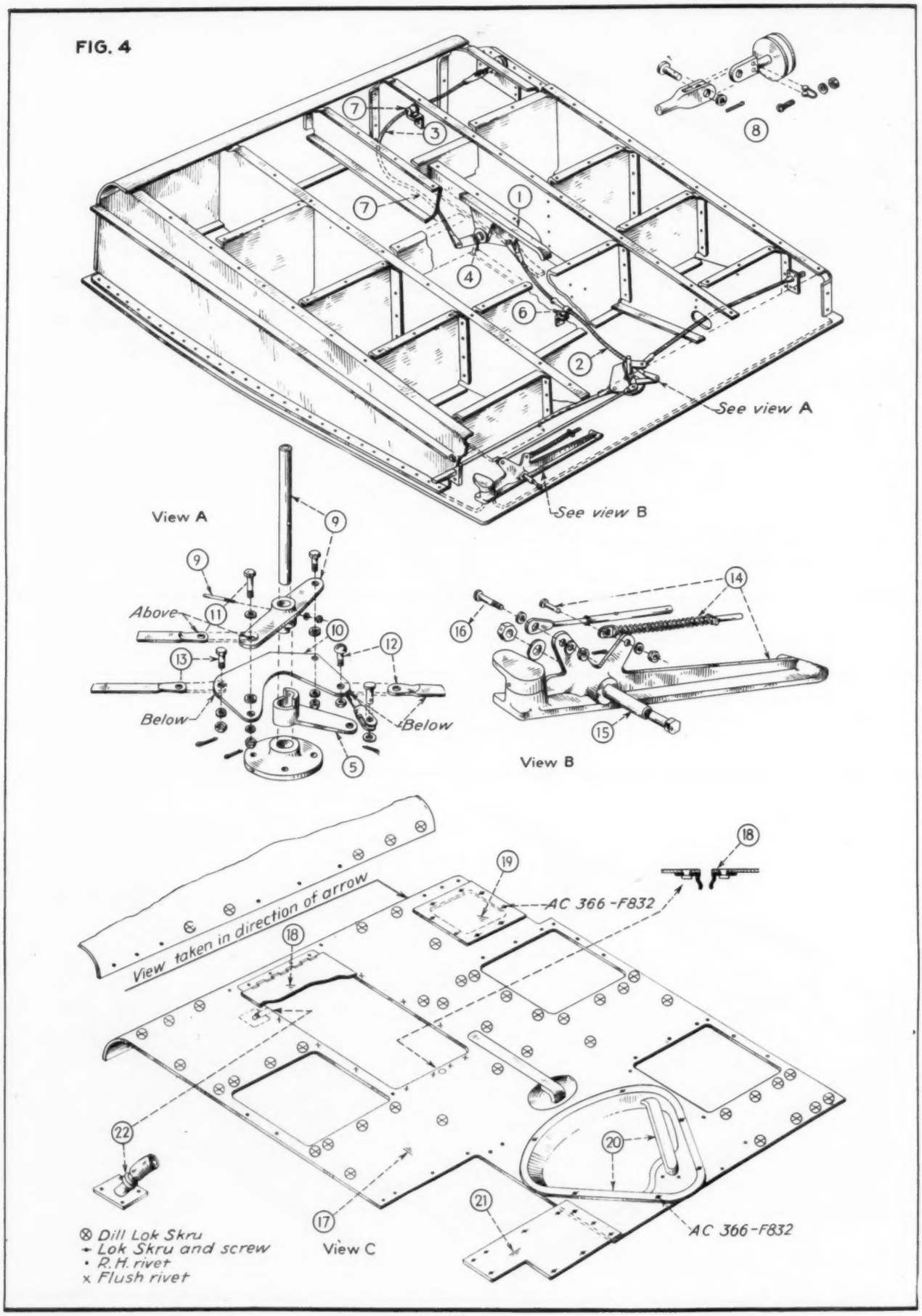
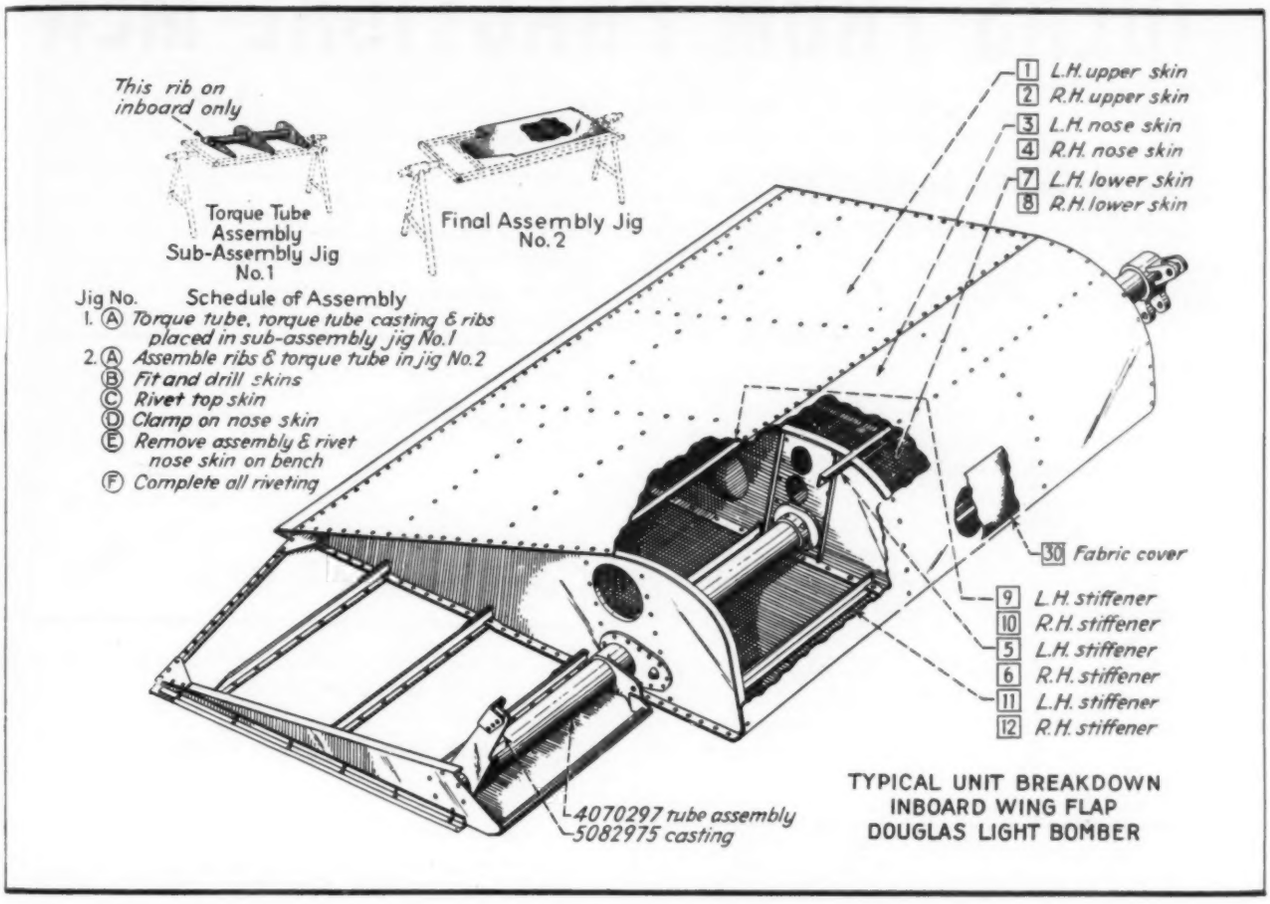


FIG. 4


See view A
See view B
View A
Above
Below
Below
View B
View taken in direction of arrow
AC 366-F832
AC 366-F832
⊗ Dill Lok Skru
+ Lok Skru and screw
• R.H. rivet
× Flush rivet
View C

Perspective Views Show All Steps in Assembly for Workers and Supervisors


This rib on inboard only
Torque Tube Assembly Sub-Assembly Jig No.1
Final Assembly Jig No.2
Jig No. Schedule of Assembly
1. Ⓐ Torque tube, torque tube casting & ribs placed in sub-assembly jig No.1
2. Ⓐ Assemble ribs & torque tube in jig No.2
Ⓑ Fit and drill skins
Ⓒ Rivet top skin
Ⓓ Clamp on nose skin
Ⓔ Remove assembly & rivet nose skin on bench
Ⓕ Complete all riveting
1 L.H. upper skin
2 R.H. upper skin
3 L.H. nose skin
4 R.H. nose skin
7 L.H. lower skin
8 R.H. lower skin
30 Fabric cover
9 L.H. stiffener
10 R.H. stiffener
5 L.H. stiffener
6 R.H. stiffener
11 L.H. stiffener
12 R.H. stiffener
4070297 tube assembly
5082975 casting
TYPICAL UNIT BREAKDOWN
INBOARD WING FLAP
DOUGLAS LIGHT BOMBER

Insets in this production illustration show workmen how to place the unit in the jigs

Frequently sketches may be made of a complete job for the use of supervisors and then the individual breakdown sketches are made for the use of workmen on the line.

When a set of production illustrations is ready for an assembly line, it is reproduced in blueprint form and the necessary copies are distributed to the stations involved. Generally the drawings are posted on a nearby bulletin board. If design changes are made, the portion concerned is killed and a sketch of the change posted alongside. Sometimes it may later be desirable to redraw the entire sketch to incorporate the change in its proper position.

From the first it has been found that to produce production illustrations both artistic and engineering training is required, with emphasis on the engineering. The graphic artist trained in two-dimensional work is of no value, without special training in the three-dimensional field. Recently men have been trained especially for this work at schools such as the Art Center School in Los Angeles.

To date the development and use of production illustrations has been largely confined to the aircraft industry because it first developed there and because the need for some such method of instructing workers has been greatest in the rapidly expanding aircraft plants. There is no reason, however, why the principle cannot be applied to any industry which uses an assembly-line system. In such cases the value of the drawings will be found to vary directly with the number of parts and the complications involved.

Workers quickly find the proper method of assembly

IDEAS FROM PRACTICAL MEN

Form Tool Machines Searchlight Ring

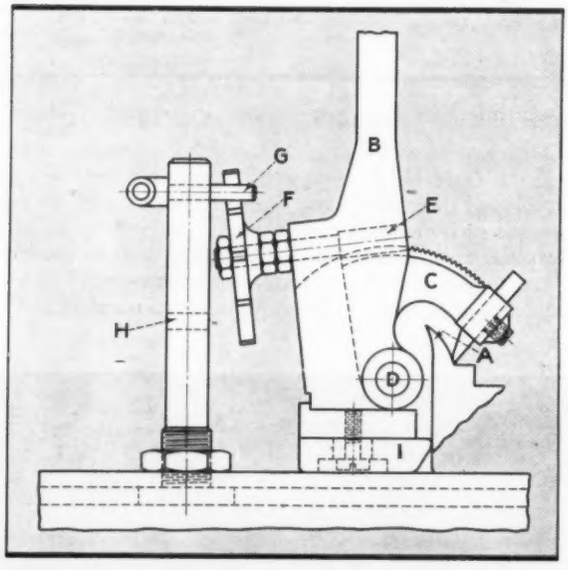
BY FRED C. COLVIN

Bronze searchlight rings 5 ft. in diameter are cast by the Richmond Foundry & Manufacturing Company. Five rings are made from each casting, and each casting weighs about 440 lb.

After these rings are roughly turned to shape and cut off from the main casting they are held in a cast iron boring mill fixture. This fixture is bored to receive the ring, which is held in place by twelve steel clamps.

Finish turning was at first attempted with a form tool but it was difficult to avoid chatter, and so the tool shown in the drawing was developed. With modifications it can be used for either convex or concave surfaces.

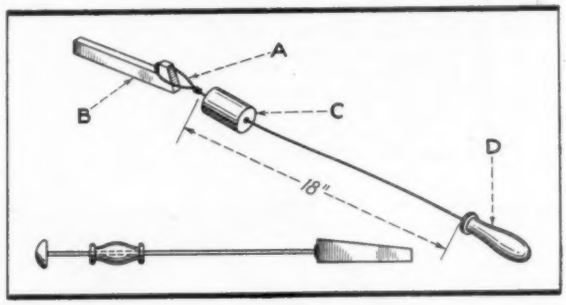
In the drawing this tool is turning convex surface *A*. The tool is mounted on shank *B* carrying tool support *C* which is pivoted at *D*. The curved upper surface of tool support *C* forms a segment of a worm



Large rings are finished turned without chatter by using this special tool. With certain modifications it can be used for either convex or concave surfaces

wheel that is actuated by worm *E* which carries star wheel *F* on the other end. Pin *G* strikes star wheel *F* as the table revolves. This action turns the worm and feeds the tool over the work. For reversing the motion of the tool the pin is moved to hole *H* so that worm *E* turns in the opposite direction.

The tool is supported by a sliding control between ring *I* that locates the ring being turned, and the bottom of the tool holding member. For turning concave surfaces the tool arm is pivoted above the cutting tool, but the method of operation is the same as that used for turning convex surfaces.



Keys can be removed without difficulty by using a weight sliding on a wire loop or rod

Key Remover Uses Percussion Principle

BY TOM KANIPE

A simple device for removing keys can be made by employing the percussion principle. A wire loop fits over the Gib-head of the key. This wire passes through a weight and has a handle at the end. The weight, which is free to slide on the wire should be about 8 or 10 lb.

In operation loop *A* fits over Gib-head *B*. Weight *C* is thrown against handle *D* which is held with one hand. With a throw of about 18 in. almost any key of this type can be removed.

The same principle can be used advantageously at the drill press. In this case the weight slides on a rod which is brazed to the end of the key.

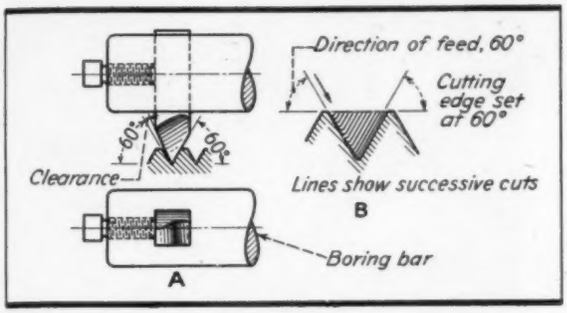
Internal Threads Cut Without Chatter

BY C. A. LEE

Heavier cuts can be made on internal threads and a smoother finish obtained by grinding tools to cut on the rear edge. The method is especially useful when the lathe carriage or compound is a little light for the job.

External threads offer little difficulty. An experienced machinist will set his compound 30 deg. to the right and feed along one side of the thread. Cutting is on the forward edge only and the toolbit can be ground with clearance so that it will cut without tearing.

Since boring tools cut on the front edge it is natural to grind tools for cutting internal threads in the same way. The compound is turned 30 deg. to the left and



Chatter can be avoided in cutting internal threads by grinding the tool to cut on the rear edge. The succession of cuts is shown at *B*

again all cutting is done on the forward edge. This method works satisfactorily, but there is a tendency to chatter.

If the tool is ground to cut on the rear edge, instead of the forward edge, this chatter can be eliminated. The compound is left at 30 deg. to the right, as for external threads. The tool should be ground with slightly less than 60 deg. included angle. The cutting edge should be horizontal and at center height.

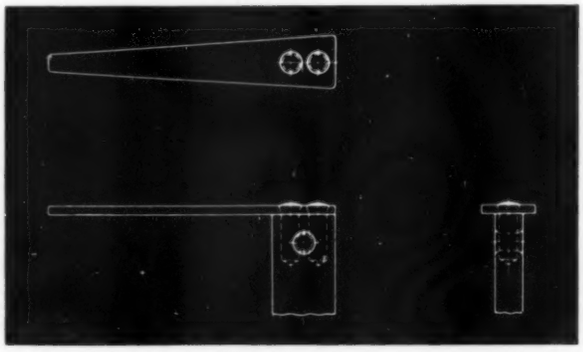
Because of the helix angle, the tool is cutting on the under side and tends to spring out slightly rather than gouging. In the drawing, *A* shows the setting of the tool and *B* the succession of cuts which produce the desired thread.

Spring Fastened in Limited Space

BY MARTIN H. BALL

Pins can be used to fasten a flat spring where space is limited. This was used where a rigid fastening was demanded, and screws of any type could not be used because the equipment was subject to a constant vibration.

Holes were carefully sized to make a drive fit for the pins. Two small pins were driven into the vertical holes with a third pin driven between them at right angles. This latter pin cut into the others slightly and served as an anchorage for the two pins which were afterward riveted over to form a head on top of the spring.



Flat springs can be held by pins where space is limited and vibration prevents the use of screws

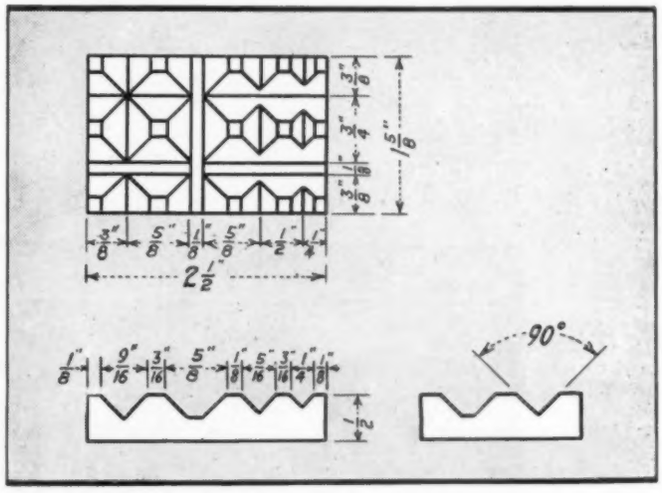
False Vise Jaw Holds Cylindrical Objects

BY C. F. FITZ

A mechanic is frequently faced with the problem of holding cylindrical objects in machine vises, which is rather difficult to do with the conventional equipment found in the average machine shop.

To overcome the difficulties which usually arise in holding cylindrical work we designed and made the false jaw shown in the drawing. The false jaw was made from tool steel properly hardened and tempered and ground, and was so designed that a large variety of sizes of stock can be held.

In use the false jaw is placed against the stationary jaw of the vise and the work inserted between it and the movable jaw. The false jaw can also be used as a regular V-block for laying out work.



A variety of sizes of cylindrical stock can be easily held in a vise with the aid of this false jaw

Lathe Toolrest Quickly Refinished by Milling

BY FRANCIS J. STEIDLMAYER

An interesting method of planing the worn toolrest on a lathe is described by Laurence F. Southwick (AM—Vol. 86, p. 299), but a variation in the procedure will do the job in a shorter time, and without the necessity of hand cranking.

A 3 in. or 4 in. boring bar about 3 ft. long is chucked in the lathe and supported by a center at the outer end. In the cross hole, which should be midway between the ends of the bar, locate a $\frac{1}{2}$ in. square fly cutter ground with a round nose and clearance on both sides. The cutter is adjusted and locked in position to make a cut of the depth of the worst worn area on the toolrest.

The lathe is run at about 200 r.p.m. Engage saddle motion with 0.015 to 0.020 in. longitudinal feed. Take the first cut across the near side of the toolrest. For the second cut, back out cross-feed screw about 0.60 in., reverse saddle motion to travel towards tailstock and mill back to left of tool. Continue backing

out cross-feed screw and reversing saddle until entire top of toolrest is milled true. If toolrest is compound, it should be set so slot is parallel with shears before starting to mill.

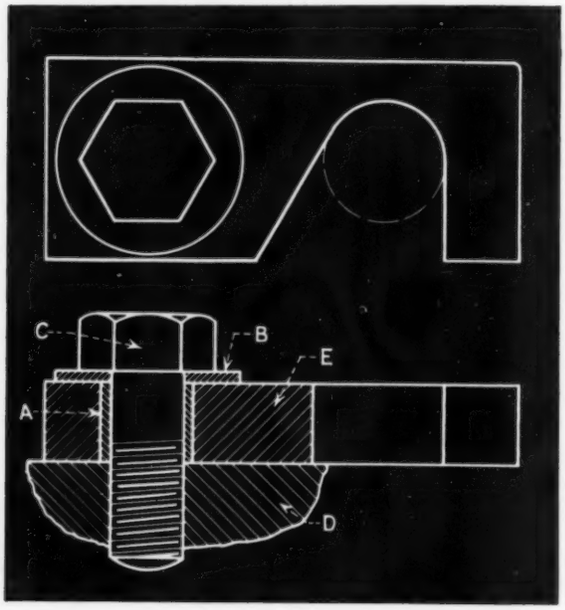
The job can be done in this way in about a half hour. The 200 r.p.m. may seem inconsistent considering the swing of the fly cutter—6 to 9 in.—but it works if too deep a cut isn't taken on the toolrest.

Alternative Substitute for Shouldered Screws

BY H. B. MARTIN

Another substitute for shouldered screws in cases like that described by Eugene Grosz (*AM*—Vol. 86, p. 223) is shown in the drawing. In this method collar *A* and washer *B* are interposed between the head of standard cap screw *C* and body *D* into which the cap screw is fitted.

This arrangement provides a smooth surface for operating latch *E* to swing on. The washer is not absolutely necessary, but it will help avoid movement of the latch in any direction except the swinging motion around the cap screw. If the washer is omitted the latch will have more of a tendency to vibrate.



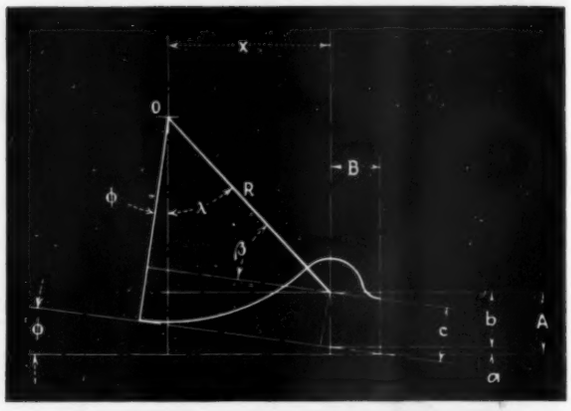
An ordinary cap screw used in combination with a collar and washer will serve as a satisfactory substitute for shoulder screws

Locating Radius Center by Trigonometry

BY HENRY R. BOWMAN

We recently had occasion to make a templet to check the contour of the "bell" at the muzzle end of a gun which we were manufacturing.

Considerable difficulty was met in locating center *O* of radius *R* as shown in the drawing. This center had to be located accurate to 0.001 in.



The center O can be located with extreme accuracy by the use of trigonometric calculations

In the drawing, *A*, *B*, *r*, and ϕ are known to start with. The dimension X is needed in order to locate center *O*. The problem was solved by the use of trigonometry in the following manner:

$$a = B \tan \phi \qquad \text{Sin } \beta = \frac{R - c}{R + r}$$

$$b = A - a \qquad \lambda = 90° - \beta - \varphi$$

$$c = b \cos \phi \qquad x = R + r \sin \lambda$$

The use of this method located the center with the desired accuracy.

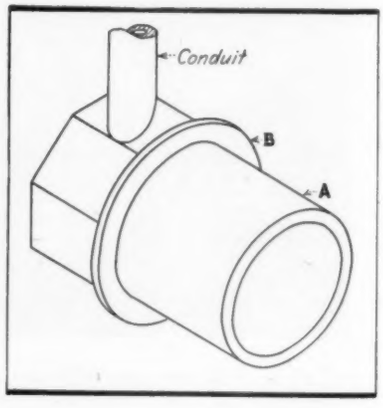
Guard Protects Light Switch

BY F. C. FRANKLIN

Our shop handles large quantities of bar stock and we have been constantly faced with the problem of replacing fuses or broken switches which had been bumped by bar stock in the process of handling the bars in the plant.

We have overcome this difficulty by attaching a piece of pipe *A* with machine screws to the coverplate *B* of the outlet box which has the switch mounted on it.

This has not only saved us labor and switches but has also eliminated accidents which resulted many times from having steel bars coming in contact with exposed electrical contacts of broken or cracked switches causing an electric shock.



Breakage of light switches and fuses resulting from bumps in handling bar stock can be eliminated by attaching guard *A*

Armament

SECTION OF AMERICAN MACHINIST

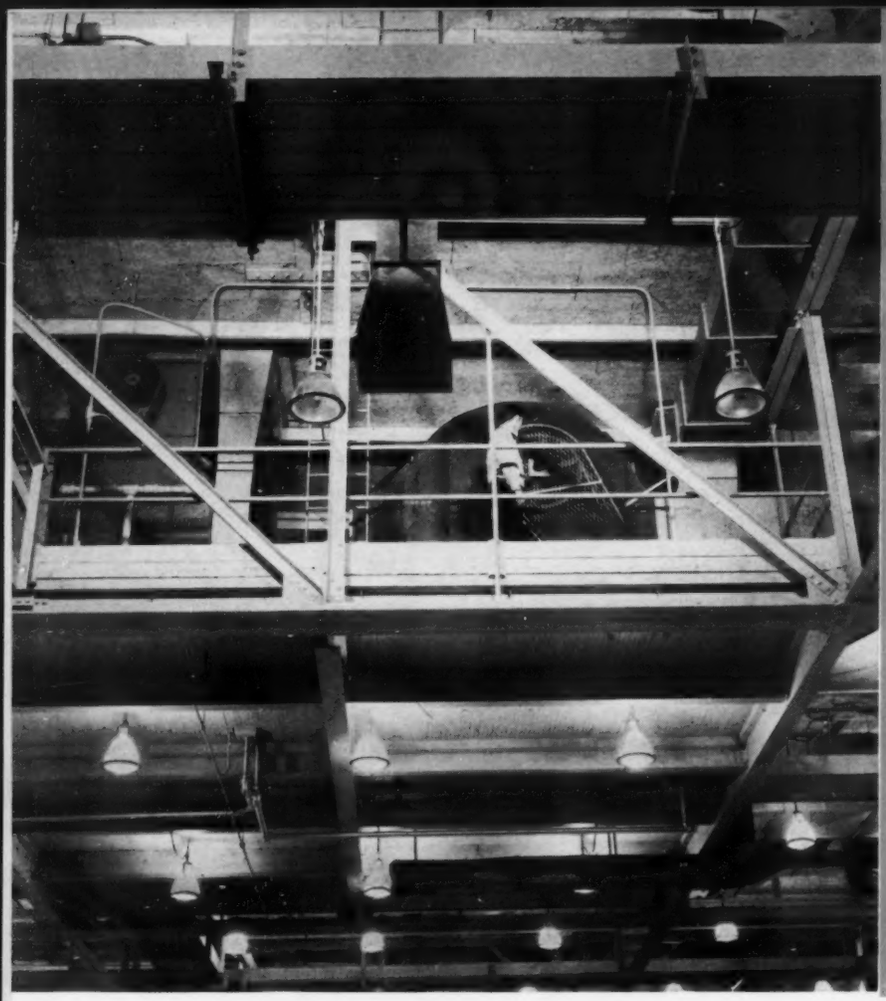
Bombers Get the Green Light

By R. A. STEINBAUER

ALTHOUGH LIGHT and climate are artificial in the new aircraft factory here described, the intelligent planning which went into its development and the personal enthusiasm which is part of its operation, are both very genuine indeed. Every man of the organization has cooperated in an endeavor to provide ideal production conditions so that maximum bomber production may be achieved with a minimum of friction and strain.

The principle of control has been carried to the highest degree. Even the material-handling trucks, which distribute and transfer parts and materials throughout the plant, operate on a regular timetable. And the men at machines are kept supplied with work and tools according to a control system which employs automatic signal lights. Such a system of stop-and-go lights is also being used on a six-sided hydraulic press.

This article has been reviewed and approved by the proper military authorities



BOMBERS GET THE GREEN LIGHT

This platform air-conditioner in the roof of a production building is but one of 92 separate heating and air-control units throughout the plant. Decentralization of such equipment will minimize bomb damage in case of air raids

With six work tables feeding under a single central press, each table operator is independent of all others and operates through a traffic control device which takes the tables under the press in the sequence in which the operators signal for clearance.

The machine shop is one of the most modern yet to go into production in the aircraft industry. The factory itself is designed for "black-out" production under possible air attack. To reduce vulnerability to bombing, the plant is decentralized, with buildings set apart from each other so that no one bomb could possibly damage more than one building. All utilities are duplicated. Light traps prevent escape of any stray light beams at night. Production has been under way since September, 1941. Full production has now been reached.

The dispersion of plants in an industrial zone, which is the policy of this company, is advantageous for strategic and other reasons. There are many advantages to having the plants far enough apart to spread personnel and materials traffic, while they are close enough together to permit unified management. A regular personnel and materials transportation service is maintained on schedule between the various plants by means of trucks and station wagons, and it is planned to provide a schedule air service for executive transportation and movement of special parts.

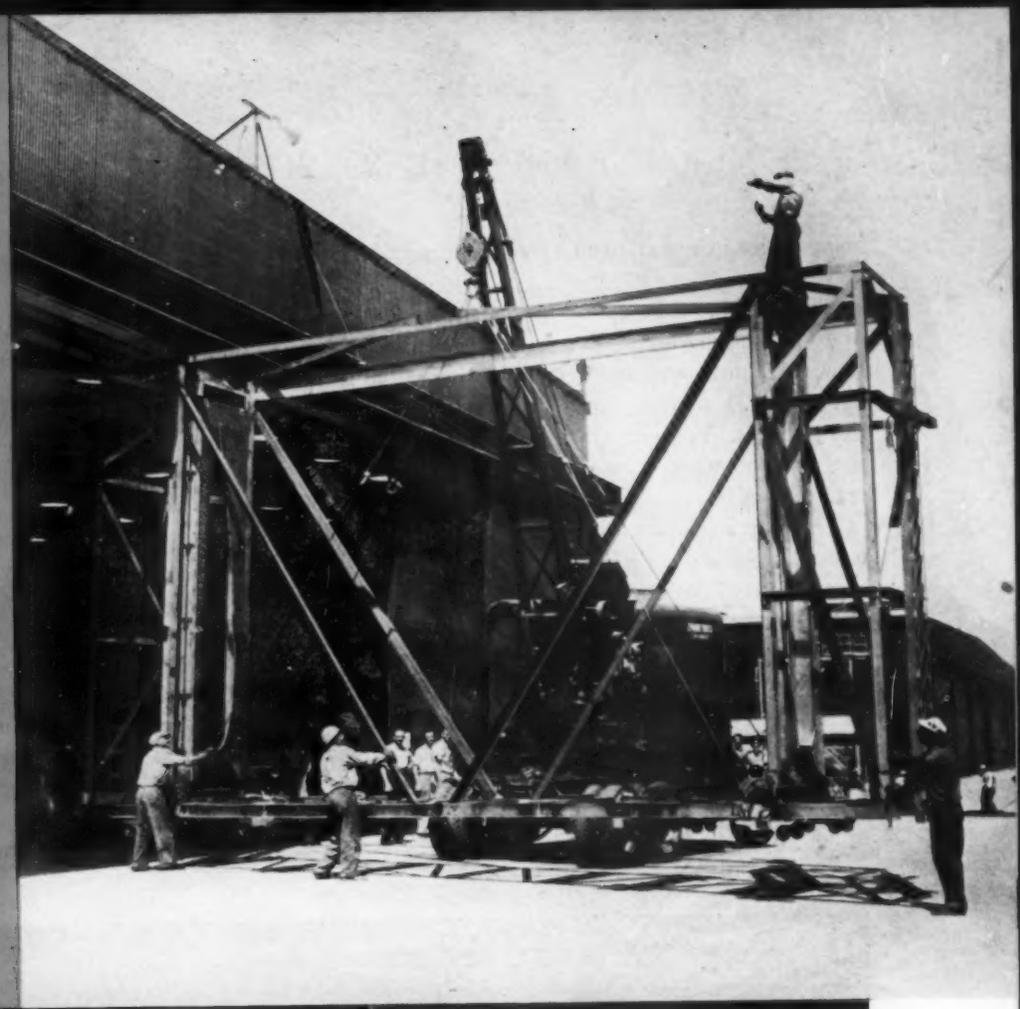
Costing well over $10,000,000, the new plant is laid out to provide for one-way flow of material from the time it enters the receiving buildings. Operations and processing departments are so arranged that parts do not back-track at any point.

Numerous ultra-modern industrial features characterize the plant, such as the use of approximately 9,000 mercury vapor lamps located at ceiling height of 35 ft. above floor level to provide shadowless illumination everywhere. Each building is completely fireproof in construction and is fire-protected by automatic sprinklers. To minimize bomb damage to the air-conditioning and heating system, it has been installed in multiple units. There are 70 independent refrigerating and air-conditioning installations, and 22 different steam boiler rooms throughout the plant.

Production Set-Up Uses Subcontractors

All of this company's plants are designed to make the most effective use of the outside production facilities provided by a multitude of small shops as well as the closely integrated subcontracting done by major firms. These organizations have tooled up for and are now in production on subcontracts. All of the firms had machinery and men available to swing into quantity production of complete component parts such as wings, engine nacelles and tail groups. These will flow in quantity to the new assembly plant on several hundred specially-designed railroad cars which are

Before the new plant was completed, jigs for major and minor subassemblies were finished in other plants. Here is a wing jig being delivered. Supervisors and other personnel were trained in other factories prior to opening the new one



Chemical and physical testing of materials and metals for bombers are conducted in a completely equipped laboratory. Chemists and engineers check specifications of supplies and establish new standards

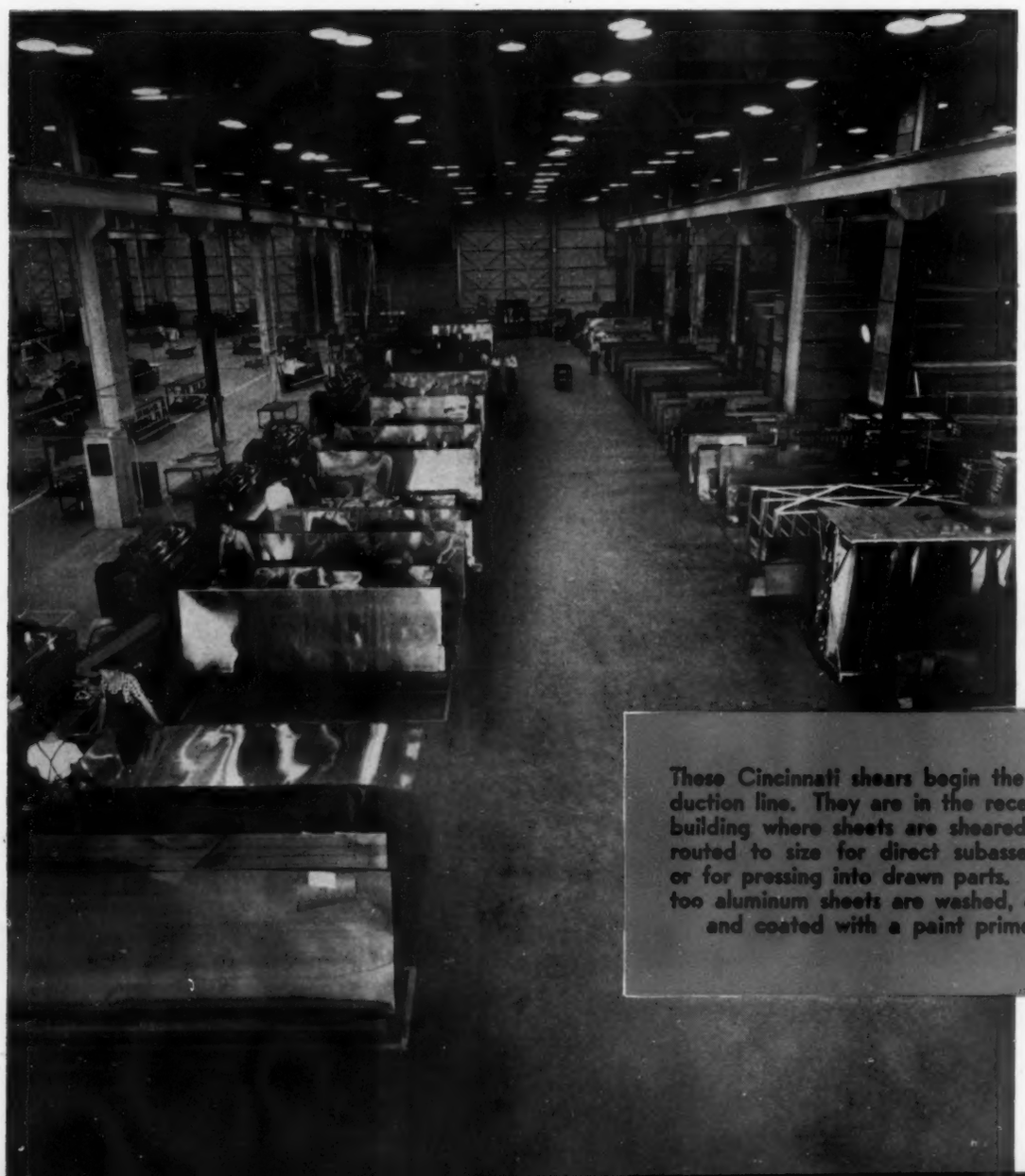
being placed in operation on a trans-continental shuttle service.

The machine shop at the new plant has a battery of 70 milling machines, 50 screw machines and turret lathes, 12 horizontal and vertical boring mills, and a battery of 35 surface, internal, external, and centerless grinders. Yet with all this equipment nearly half the machine work required by the plant is subcontracted locally.

The shop is laid out for comfort, efficiency and flexibility. Light and air-conditioning arrangements have been described above. The shop floor is of sufficiently heavy concrete to permit tools to be moved about and re-arranged whenever production requires. All air, electric and water services are installed in special service tunnels with outlets available anywhere on the floor. Individual rubber grille mats are provided at all machines for the comfort of operators. Considerable attention has been given to material-handling equipment, including trucks, cranes, hoists, and monorails, so that physical effort is kept at a minimum everywhere.

A master control system covers all work production including tooling. Foremen and group leaders arrange all work set-ups so that the individual operators are freed for steady production work at their machines. Tool runners supply needed tool set-ups from a series of five master tool cribs. Tooling and work distribution are both handled from a single central control booth, with production control supervisors stationed in the various departments. A system of signal lights is now under development so that supervisors may tell at a glance when work is nearing completion or when new tooling is needed.

The entire shop layout was planned in advance from a master layout board where every item of equipment was located in exact position and to exact scale. It should be emphasized that this equipment is all of universal type. Aircraft production is of such a nature that this will always be true, with certain few



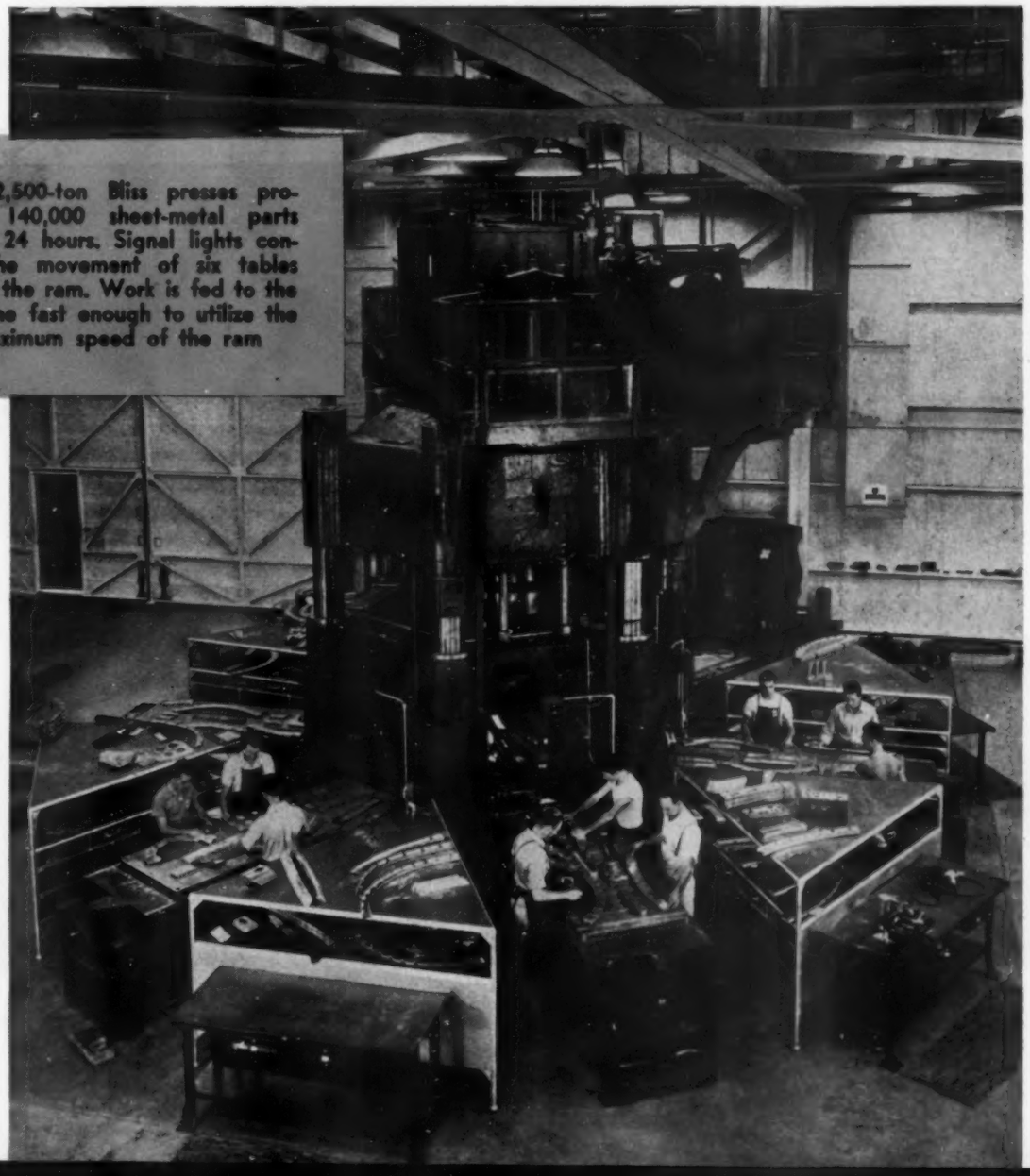
These Cincinnati shears begin the production line. They are in the receiving building where sheets are sheared and routed to size for direct subassembly or for pressing into drawn parts. Here too aluminum sheets are washed, dried and coated with a paint primer

exceptions, although this has been a lesson for production men to learn. Single-purpose equipment of such a nature as not to be quickly convertible to the production of a new design would defeat its own primary purpose. Flexibility of change is a prime requirement of all aircraft production, and especially of military aircraft. Lessons learned in actual combat must be translated with all possible speed into design changes. This frequently results in basic alterations in the form, structure, or materials of the plane. Designers often must shift from one material to another. To relieve the problem this involves, the machine shops must contain universal equipment which can be adapted to the production of the widest possible range of parts.

In addition to the production tools mentioned earlier, there is in operation a battery of eight toggle presses of 150 to 400-ton capacity; 12 swinging arm Schrillo sheet-metal routers, 40 electric spot welders including Taylor-Winfield, Federal and Sciaky models; a 300-ton Hannifin straightening press; a battery of 18 Cecostamp air-operated hammers of from 24-in. to 188-in. lift, with a table size of 96 x 60 in. There is also in operation two of the Bliss 2,500-ton six-sided hydraulic presses mentioned earlier, and one single-action hydraulic press of 1000 ton capacity.

In order to facilitate supervision a battery of powered scooter bikes is maintained for transporting personnel both between buildings, and within the production buildings. All factory buildings are connected with each other and with the administrative office by means of an air-tube conveyor system for handling orders, messages, and correspondence. Since total plant area is one square mile it is obvious that such aids are needed to conserve the time of administrative and supervisory personnel.

Materials flowing into the plant by truck and rail enter under four classifications, only two of which go through the machine shop. There are separate production flow lines for sheet stock and tubing, bar stock and castings, purchased parts and accessories, and



Two 2,500-ton Bliss presses produce 140,000 sheet-metal parts every 24 hours. Signal lights control the movement of six tables under the ram. Work is fed to the machine fast enough to utilize the maximum speed of the ram

Each air-operated hammer is mounted on springs buried in the floor to cushion shocks and prevent vibration. Each operator uses a push-button signal to notify the production control department when it is time to supply him with a new set of dies for the next job

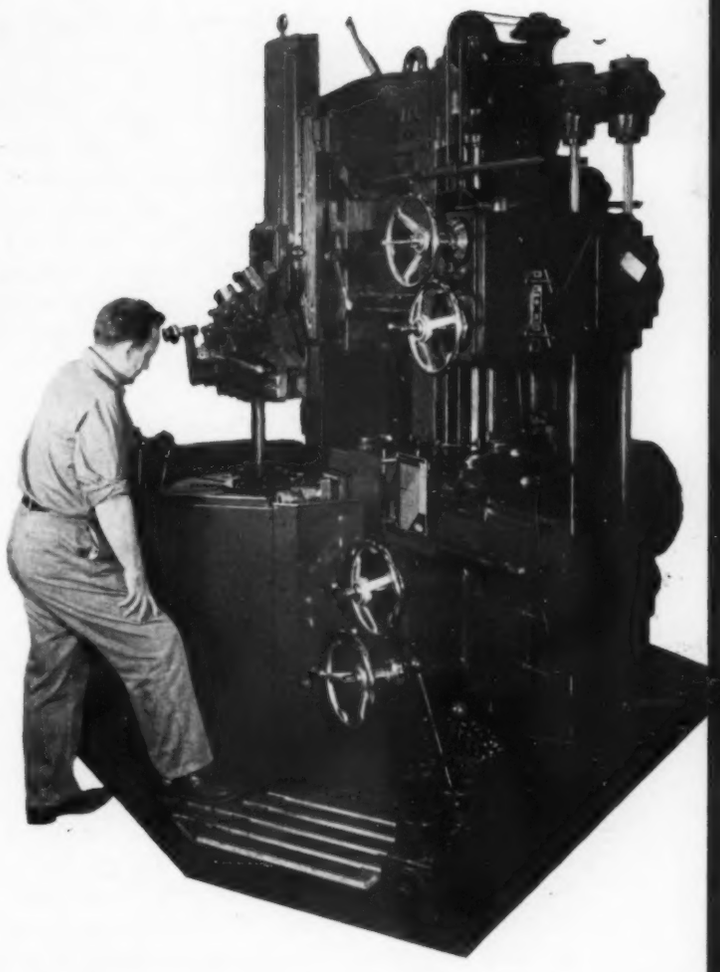
Sheet-metal parts from router and drop hammers, as well as hydraulic and toggle presses, are delivered to the spot-welding department. Shown here are six of the 40 welders used to speed production of many subassemblies

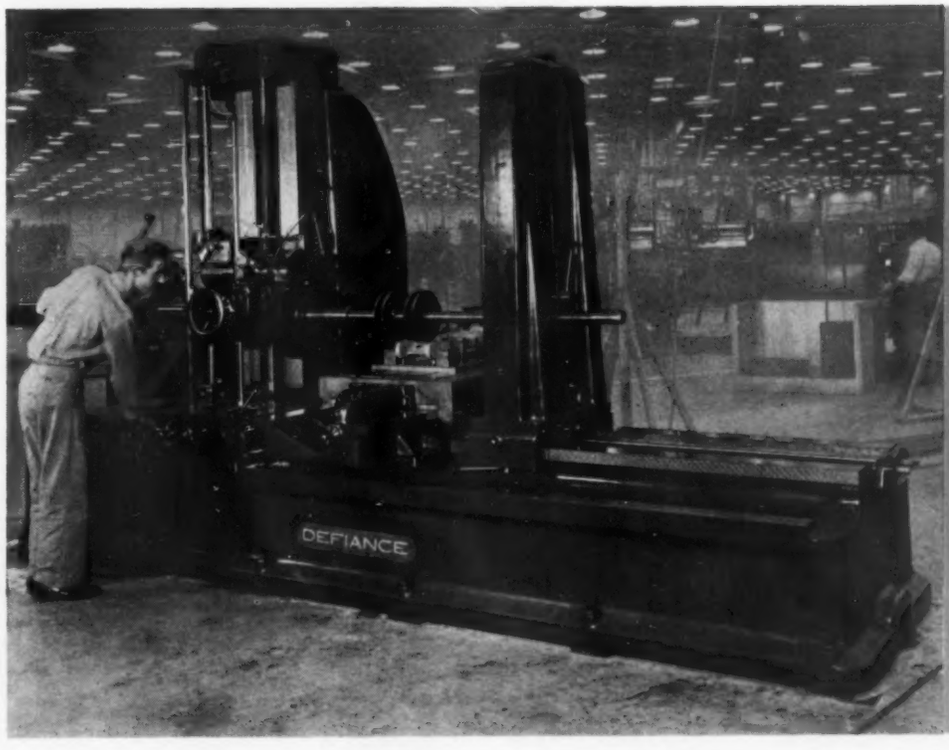
component parts and complete assemblies. The latter two categories flow directly to final assembly, except for some painting and processing in certain cases.

Sheet metal and tubing is processed complete in the receiving building before going to the fabricating building. This covers cutting to size, including routing of sheet blanks for pressing, and washing, drying, and coating with paint-primer in the case of complete sheets of aluminum alloy. The latter operation is performed on an automatic conveyor which requires no manual handling of material during the process. Bar stock and castings are given a general inspection check, and cut to rough size or blank where necessary before flowing to the machine shop.

Typical of the "continuous flow" idea is the sheet-metal hammer room. At one end is a pattern department where patternmakers are automatically supplied materials by a conveyor system. The patterns are picked up by cranes when completed, carried down an inspection line, and then to the foundry for casting of the hammer dies. The handling equipment then carries the dies through grinding, cleaning, and stamping (for identification) departments and finally to storage. A crane lifts the dies from storage to the long line of air-operated hammers. When the hammer operator wants to change a die he merely pushes a button which notifies the production control department that it is time to supply him with a new set of dies and material for the next job.

Most impressive pieces of equipment in the shop





In the machine shop, as well as in assembly departments, foremen and group leaders arrange all work set-ups so individual operators can be free for steady production work. Runners supply tools from five master cribs

Machine tools in the plant are for the most part general-purpose types. This horizontal mill is set-up to face the bosses of the tail-wheel fork. Single-purpose tools are in limited use because they cannot be converted quickly to the production of new designs—and flexibility of change is a prime requirement in aircraft production

are the two 2,500-ton Bliss hydraulic presses. Using the Guerin process developed by this company, these two presses are the first of the six-sided type to be installed anywhere. Various means have been tried heretofore to achieve the maximum production capacity of the big hydraulic presses developed for aircraft metal forming. One of the first methods was to provide four loading positions, feeding trays of dies in under the rubber blanket of the press punch from any of the four sides. A variation of this was a three-sided press with a rotating tray which had one station for loading, one for pressing and one for unloading. Still another method has been to provide a continuous flow conveyor system carrying a number of die trays around in sequence through the loading, pressing and unloading operations. With these methods a delay at one station may hold up work at all the others. Also, it is difficult for a single press operator to keep track of the progress of work on a number of stations at once.

Six-Station Press Controlled Automatically

By providing six loading stations on the new Bliss press, work can be fed into it up to the maximum working speed of the press ram itself. Each of the loading tables has four operators, or 24 for the entire press. One of the four men at each table is the control man on feeding work into the press, but any one of the four can stop the press instantly if necessary. Operation is fully automatic, with workers being protected by glass gates. A master control system with a set of signal lights takes work in sequence and informs each table of the sequence so that an operator knows at a glance whether the press is in use and when his table will be carried into position for pressing. With all tables feeding at top speed this press will perform a complete cycle of pressing operations on all tables in 1¾ min. Work of feeding the press is further facilitated by a conveyor system which feeds blank stock to all six tables, and carries the completed parts to various subassembly departments.

The key to the production program has been the provision of personnel for the operation of the plant. This was planned long in advance of starting production. First move was to select certain key men from other of the company's plants as executives and supervisors. Then an on-the-job training program was set up in two of the existing plants to build up a staff of workers prior to the time the new factory was completed. At the same time a program was started under the local public school system, in cooperation with the company's education department, for teaching essentials to a large group of untrained selectees. Coupled with this training program there is in operation at the new plant a system of upgrading workers as rapidly as possible after they are put on the job. This simply amounts to an extension of the training program and means that every worker continues to be a learner, with almost unlimited opportunity for advancement to better production and supervisory jobs.

Thousands of Douglas employees have received some form of in-plant training and more than 700 have completed full-time courses which have resulted in immediate promotions in more than two-thirds of these cases. Training courses have included tool designing and tool planning, machine operation, metal fitting and metal fabrication, production planning, pattern making, and accounting. More than 250 men have qualified as leadmen through such training, and 450 leadmen have been trained for supervisory positions of a more responsible nature. Several thousand students are now enrolled in the public school training program and many graduates of this course will be hired.

These three new lathes brought to 45 the total number now in production at the latest of this company's plants. Among other equipment, there are 70 milling machines, 50 automatic screw machines and turret lathes, 12 horizontal and vertical boring mills, and 35 grinders. Yet half of the machine work is subcontracted locally

Line Production of Shell Cases

There is no back-tracking in this production line for 105-mm. shell cases. Cases are handled throughout the plant by mono-rail cranes. Hundreds of cases an hour flow from equipment set in small area

Brass disks from which shell cases are made are shipped to the plant in returnable wooden boxes. In the first operation the disks are fed into cupping presses. Cups drop from the press base to conveyors, and after inspection for defects are annealed

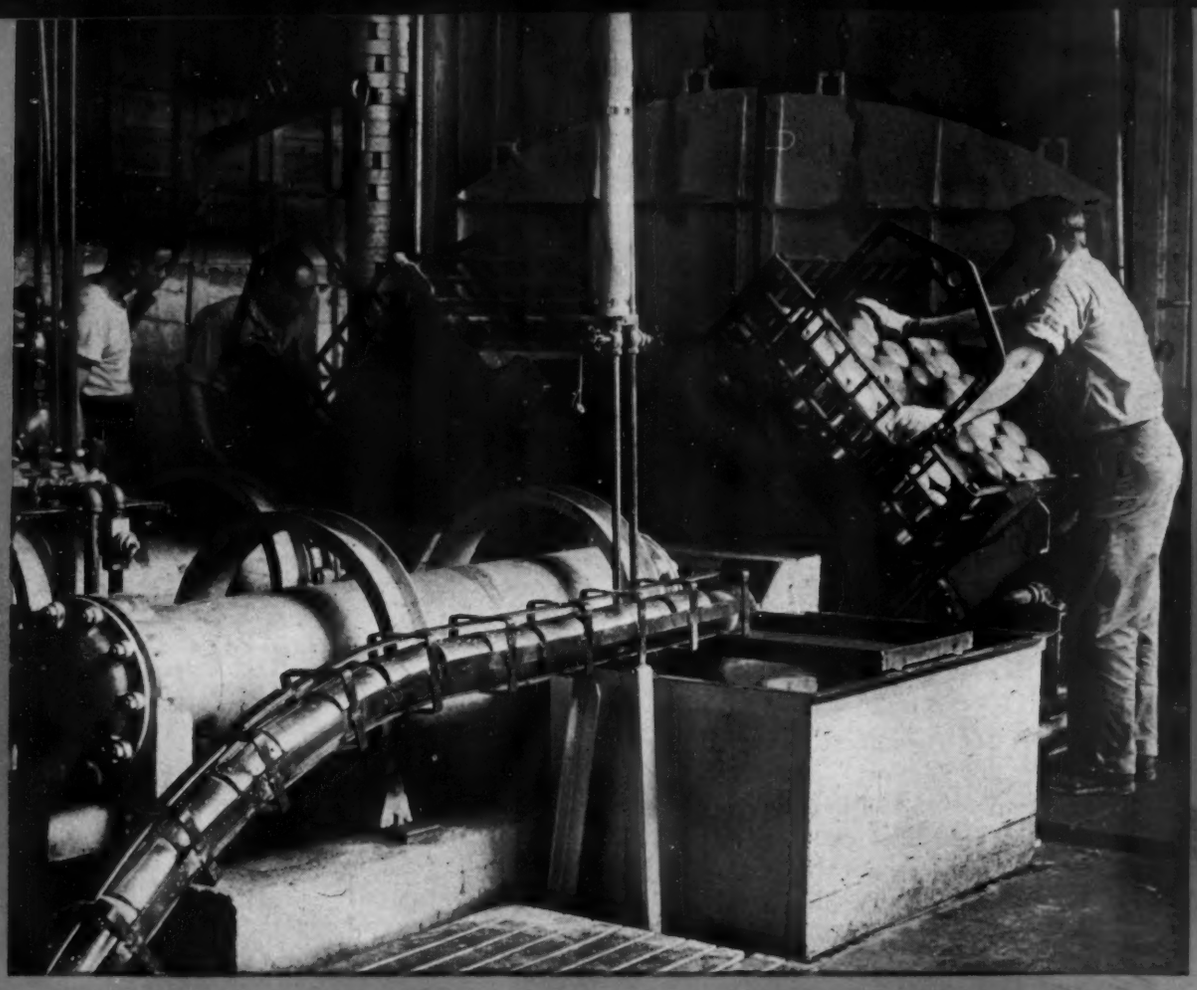
★ *This article has been reviewed and approved by proper military authorities*

MACHINE AND HEAT-TREATING equipment installed for the production of 105-mm. shell cases can be arranged for the orderly flow of work from the first cupping press through the various annealing and drawing operations to final machining and inspection. By such a layout, many hundreds of cases per hour are produced by one of the country's large manufacturers in comparatively small floor area. Another factor that has speeded production is the use of standard racks for handling the cases at the various presses and during annealing operations. The illustrations show the versatility of these racks and methods of using them.

Brass disks from which the cases are drawn are received at the plant in wooden containers fitted with 4x4-in. skids for easy handling by fork-type trucks. When empty, the containers are returned to the supplier of the disks for refilling.

Each shipment of incoming disks is inspected, 5 percent being checked by measurement of dimensions; special attention is paid to thickness. If the disks are too thin, there is not sufficient metal for the head. If the thickness varies too much, it will cause an eccentric cup. All disks are checked visually for cracks, seams, dirt and other foreign matter and defects. One disk in each 1,000 lot is checked for hardness. This is done by cutting the disk in half and testing at the cross-section. A percentage of the cut disks are examined under the microscope for grain structure.

In the first operation, disks are fed into a Haldisteel cupping die, sharp end down. The punch is made of carburized Atha-Pneu steel, chrome-plated to a depth of 0.0002 in. for a distance of 5 in. from the end. In this and following straight drawing operations, a centering wedge is used to center the die with respect to the punch, after which the die is clamped tightly. All pieces produced by the set-up are checked until the inspector is sure that the operations are satisfactory; after this, percentage inspection is maintained at each press. During all the drawing operations an oil-base drawing compound,



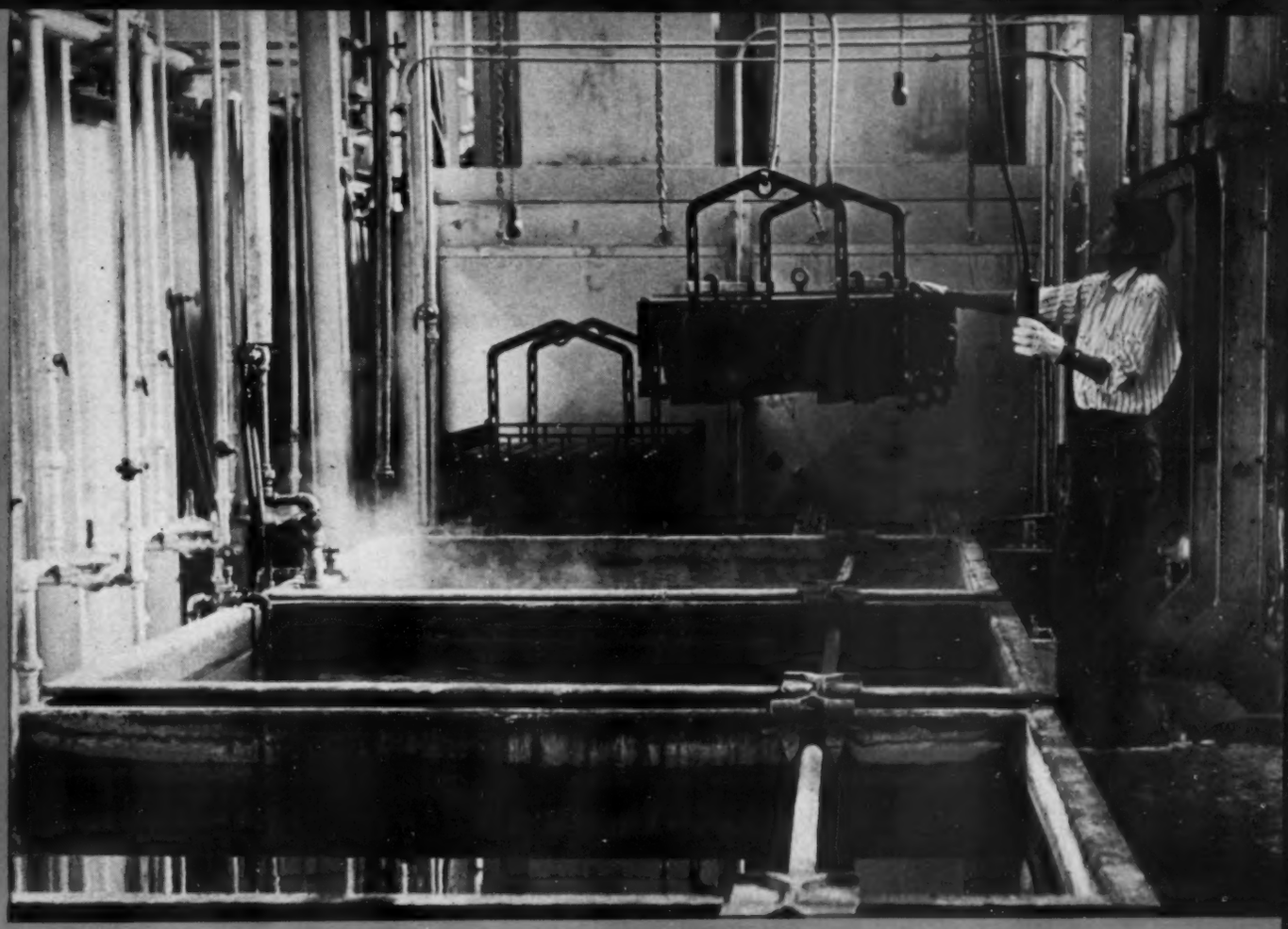
Two furnaces are used during the drawing operations, the first of which is shown here. The rack on the left contains cups from the first press; these pass through the furnace to pickling tanks and a press for the first drawing operation. Parts being loaded on the righthand rack have gone through the second drawing operation; after passing through the furnace and pickling tanks they will be ready for the third drawing operation

fed continuously on the part being drawn, serves both as a lubricant and a punch coolant.

In the cupping operation the brass disk is forced through the die, and as the punch ascends the bottom edge of the die strips the cup from the punch. The base casting in the press has a hole through the center, and an opening in the back, which permits delivery of the cup at bolster level. An inclined steel slide connects the base casting to an endless belt which delivers the cups to an inspector who washes and deposits them, open end down, in baskets ready for annealing. A certain percentage of the cups are checked with gages in order to determine if any variation in wall thickness exists.

The annealing baskets are made of 25-20 chrome-nickel steel, and are carried through a pyrometer-controlled gas-fired annealing furnace on rollers actuated by an air-cylinder pusher; the temperature-control and time-cycle equipment are checked at regular intervals to maintain uniform annealing conditions. This furnace has capacity for eleven baskets, and operates at a temperature of 1,100 F. Annealing time after cupping is two hours, and grain size after this should be 0.060-0.1230 mm. at 75 magnifications; one case in every 5,000 is checked for this grain size. The two-hour soaking period does not cause volatilization of the zinc that would create undue heavy oxides and cause trouble in following pickling operations.

When the baskets emerge from the annealing furnace they are picked up by a tram-rail hoist and carried to a lead-lined tank which contains a 3 to 5 percent sulphuric acid solution at 175 F. After several minutes in this pickling tank, the baskets are raised by the tram-rail hoist and carried to three rinse tanks, the first of which is lead-lined. Following two cold-water rinses, the cases are washed with hot water to facilitate quick drying. Since the cases are open end down in the baskets, they must be tilted for effective washing. To accomplish this there are three hooks on the bottom of one side of each basket, which fit around a Monel metal cross-rod supported on the edges of each rinse tank. When the baskets are lowered these hooks engage the Monel



All cases are washed after emerging from the annealing furnaces. Washing tanks at the rear of the second furnace is shown here. The rack at the left contains parts which have gone through the first drawing operation and subsequent anneal ready for cleaning prior to the second drawing operation. The rack at the right contains cases from the third draw. Hooks on the bottom of the racks engage bars and tilt the rack

rods; further lowering tilts the baskets to the desired angle, thereby speeding the rinsing operation.

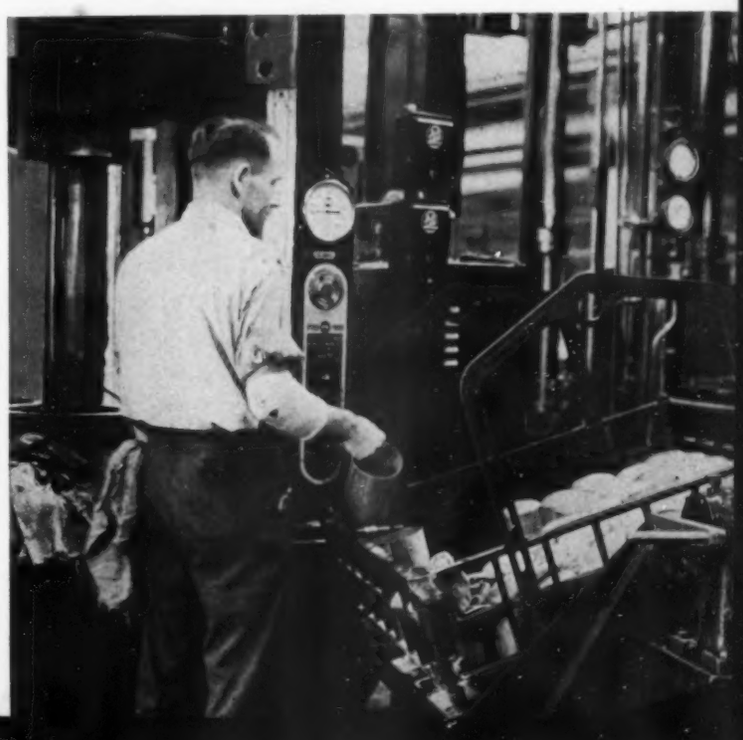
For the first drawing operation after cupping, a carbide insert is used in a steel die. The hardened and ground punch, made of Atha-Pneu steel, is chrome plated on the end for a distance slightly greater than the length of draw.

The second drawing operation is much the same as the first. The punch, made of carburized Atha-Pneu steel, chrome-plated 0.0002 in. deep to within 12 in. of the end, forces the case to the center of the die and bolster plate. A delivery tube takes the piece from the press to an operator who washes it and loads it in a basket ready for the annealing furnace.

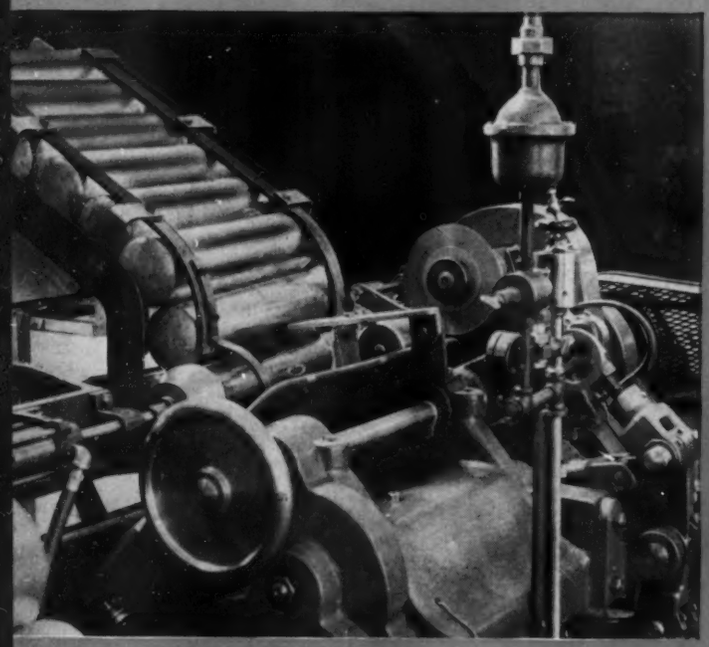
The punch and die for the third and fourth operations are similar in construction as those used in the first and second draws. However, the punches are chrome-plated up to 26 and 30 in. from the end for the first and fourth drawing operations, respectively.

The shell cases are annealed and washed after each

Racks used for annealing the cases also serve as carriers to and from the presses. These cases are ready for the third drawing operation. The racks rest on a platform which can be tilted by a hand-operated gear reducer, giving the press operator ready access to the cases



The tool-steel punches for the drawing operation are chrome-plated. The one for the fourth draw, shown here, is plated for a distance of 30 in. from the end. After this draw the cases drop through the bed of the press to a conveyor which lifts them into a washing tank. An operator lifts them from the tank and places them in a conveyor leading to an automatic trimming machine. All the drawing dies are equipped with tungsten-carbide inserts



Following the fourth draw the cases are automatically trimmed in this abrasive cutoff machine. When one case drops from the machine the following case falls into a nest from where it is pushed over a mandrel by a bell-mouthed air-operated tailstock. After trimming, the tailstock recedes, the case drops, and the cycle is repeated

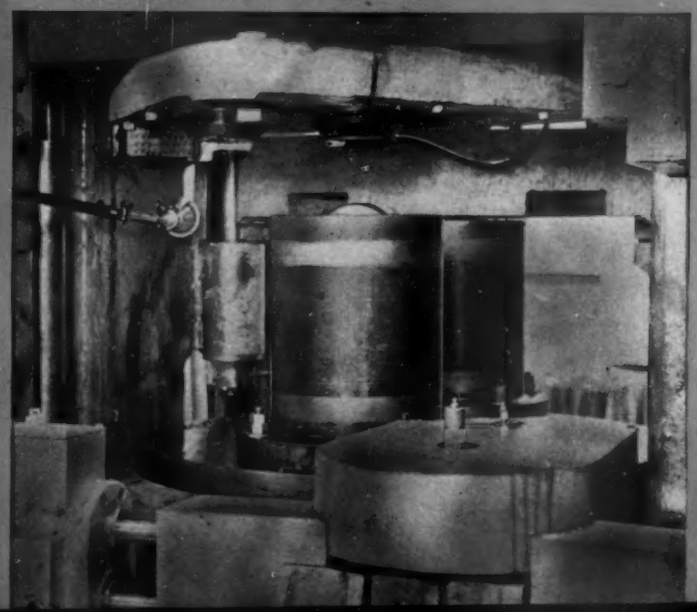
drawing operation. Washing eliminates annealing scale and permits quick visual inspection for cracks, seams, scratches or other defects. Pieces are scrapped unless observed defects can be removed or corrected in subsequent operations. If the parts are scratched, the punch and die are polished to remove defects that cause the scratches. All dies are checked from time to time with a gage to insure that they haven't worn beyond specified limits. Whenever a new punch or die is used, variation in wall thickness of every case coming from the press is gaged until the inspector is certain that the new set-up is working properly.

Cases Are Trimmed Automatically

After the last drawing operation, and subsequent washing and inspection, the cases are trimmed to specified length in an automatic cutoff machine.

After trimming, the cases are headed and indented in a 1,200-ton toggle press with a two-station die and an air-operated pick-off. Two bumpers are mounted in the ram. The first is raised slightly in the center, causing the metal to flow toward the outer edge of the case. The second bumper is flat across the entire surface. The center post of the second bumper has a small round-ended conic protuberance which indents the primer form and works the surrounding metal to get the desired flow and grain structure properties. The heading punch is made of Halcomb tool steel with the following constituents:

After trimming, the case is headed and indented in a 1,200-ton press with a two-station die and air-operated pick-off. Two bumpers are mounted in the ram. The first is raised slightly in the center, causing the metal to flow toward the outer edge. The second bumper is flat and forms the final shape of the head; however, it has a round-end projection to indent the primer form



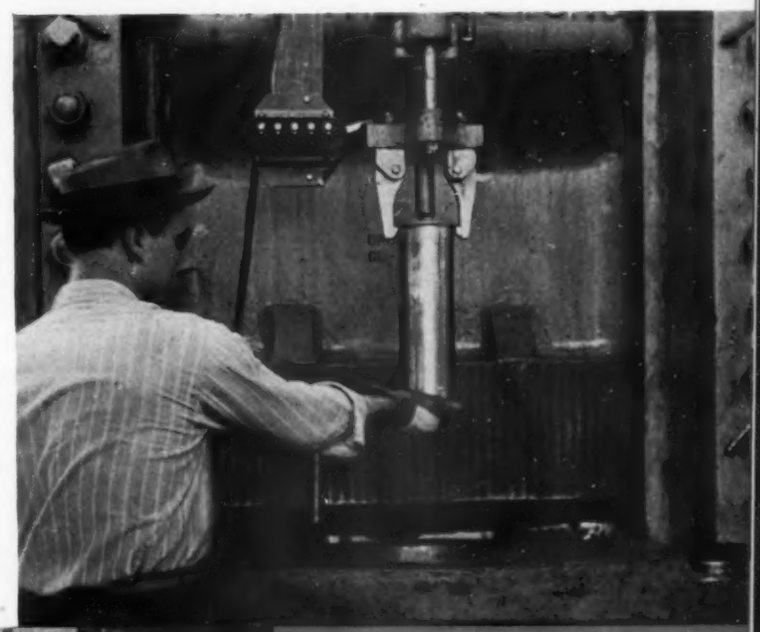
0.28 carbon, 0.44 manganese, 0.29 silicon, 4.44 nickel, 1.59 chromium, and 0.41 molybdenum. The die ring is Sanderson special tool steel No. 5, and the first and second bumpers are made of Haldi tool steel. The punch is ground and carburized to Rockwell hardness 48-49 C. At regular intervals, a case is sectionalized after heading to check correctness of the cavity.

In the next operation, the primer hole is pierced in a No. 24 Bliss press which has a tilting post instead of a bolster or table. The tilting post is mounted on the base of the press, and its action is such that a short stroke can be used with safety. The operator places the case on the post, pushes it into a vertical position, trips the press, and then pulls the post forward where he removes the case and puts it in an annealing rack. This rack consists essentially of a flat plate with holes of such size that the cases hang suspended by their heads.

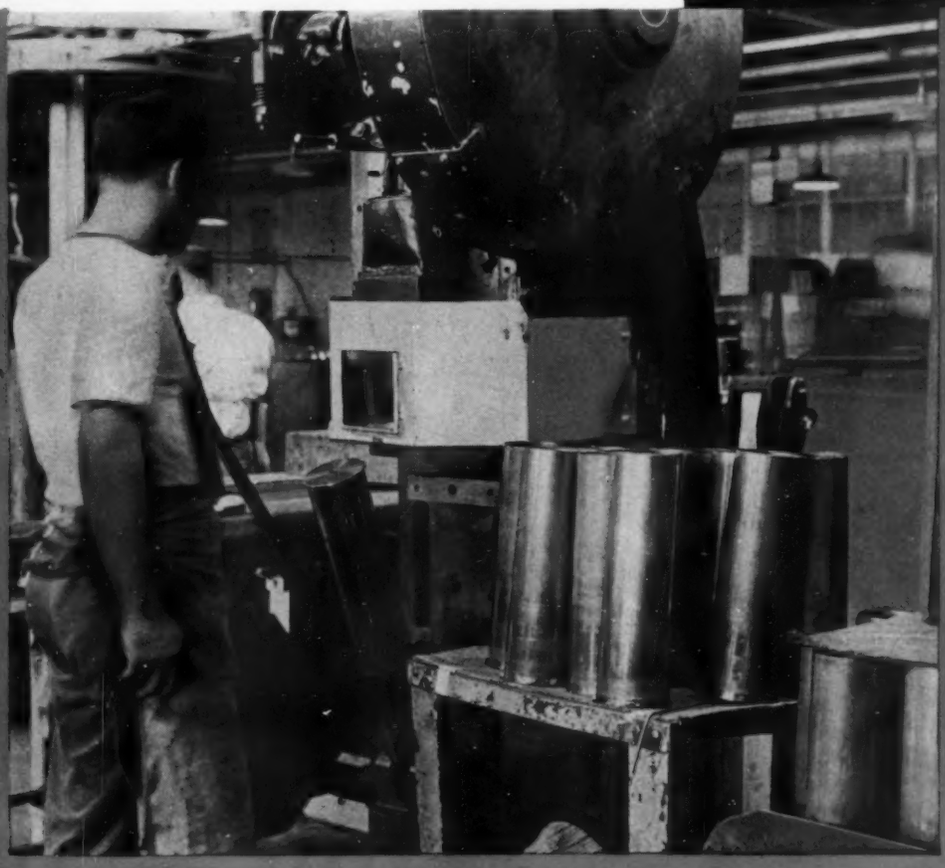
Conveyors Handle the Cases

The flat racks are lifted by a Lindberg designed automatic conveyor and elevating system which dips the cases in a 950-F. saltpeter bath for two minutes to anneal them preparatory to tapering the ends. Following the anneal, the cases are automatically raised, carried to rinse tanks, and dropped therein, again elevated, and finally carried to the unloading station.

The cases are then tapered in a hydraulic press with a mechanical ejector mounted in the bed. The operator receives the cases in the trays just as they come from the rinse. The tray is placed on a turntable which lifts the heads just enough so the operator can easily pick up the cases. Each case is dipped in a 50-50 mixture of soluble oil and lard oil and dropped in the tapering die. The press forces the case into the die, and on the up-stroke the ejector raises it from the die. After tapering all cases are examined visually for scratches, seams and folds, and



The cases are dropped into a carburized steel die, after which the ram forces it into the bottom position for tapering. An air-operated ejector automatically lifts the cases from the die for an operator who places them in a tray preparatory to washing and machining



The primer hole, indented during the heading operation, is pierced in this press, which has a tilting post instead of a bolster or table. During this operation cold metal is worked around the primer hole

gaged accurately for inside diameter at the mouth.

The cases are placed on a belt conveyor which carries them to a four-spindle automatic lathe where the heads are finish machined. They are unloaded and loaded at the first spindle. When the machine indexes to the second position a carbide form tool comes in on the side and cuts the flange, shoulder and body to correct dimensions. At the same station a subland drill runs through the rough primer hole, pierced previously in the No. 24 Bliss press, and starts the counterbore. The machine then indexes to the third position where a rough facing tool removes most of the excess metal from the head, and a flat two-lip drill enlarges the primer hole and counterbore. In the last position a facing tool finishes the head while a reamer finishes the tapered primer hole and counterbore.

The cases then go to a two-spindle drilling machine where they are held in a special collet chuck for facing the open ends. This operation accomplishes three purposes: removes any irregularity at the open end following the taper, trims the case to the proper length, and chamfers the edge of the open mouth to eliminate burrs.

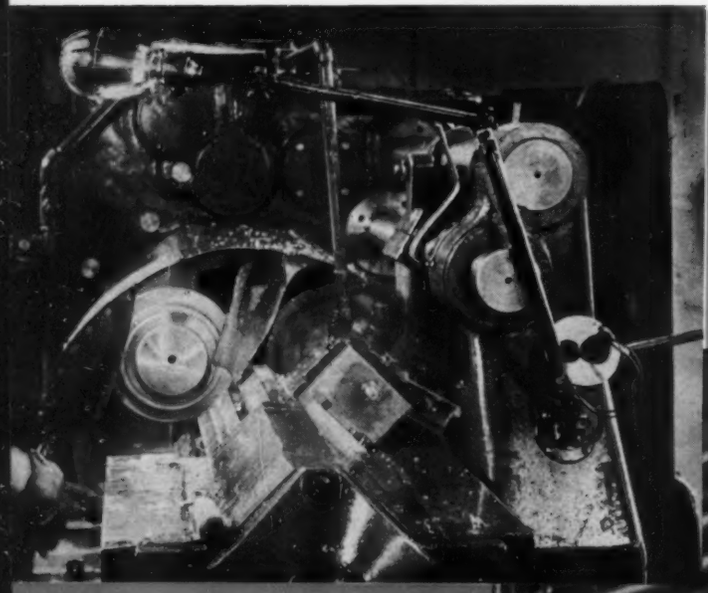
The finish machining operation and trimming to length are also done at one time in a special Coulter machine.

A four-station drilling machine has been built for drilling and tapping holes in the base inside the case for two eyelets which support the powder bags. This machine is a special horizontal unit in which the cases are supported in special fixtures at stations marked on the table ahead of the drill and tapping devices.

Oversize Cases Are Redrawn

Each machine operator has gages to check the cases as they come from his machine. Upon completion of the machining of the head and trimming, all cases are gaged in a maximum profile gage, and those found too large are resized in a tapering draw press and re-gaged.

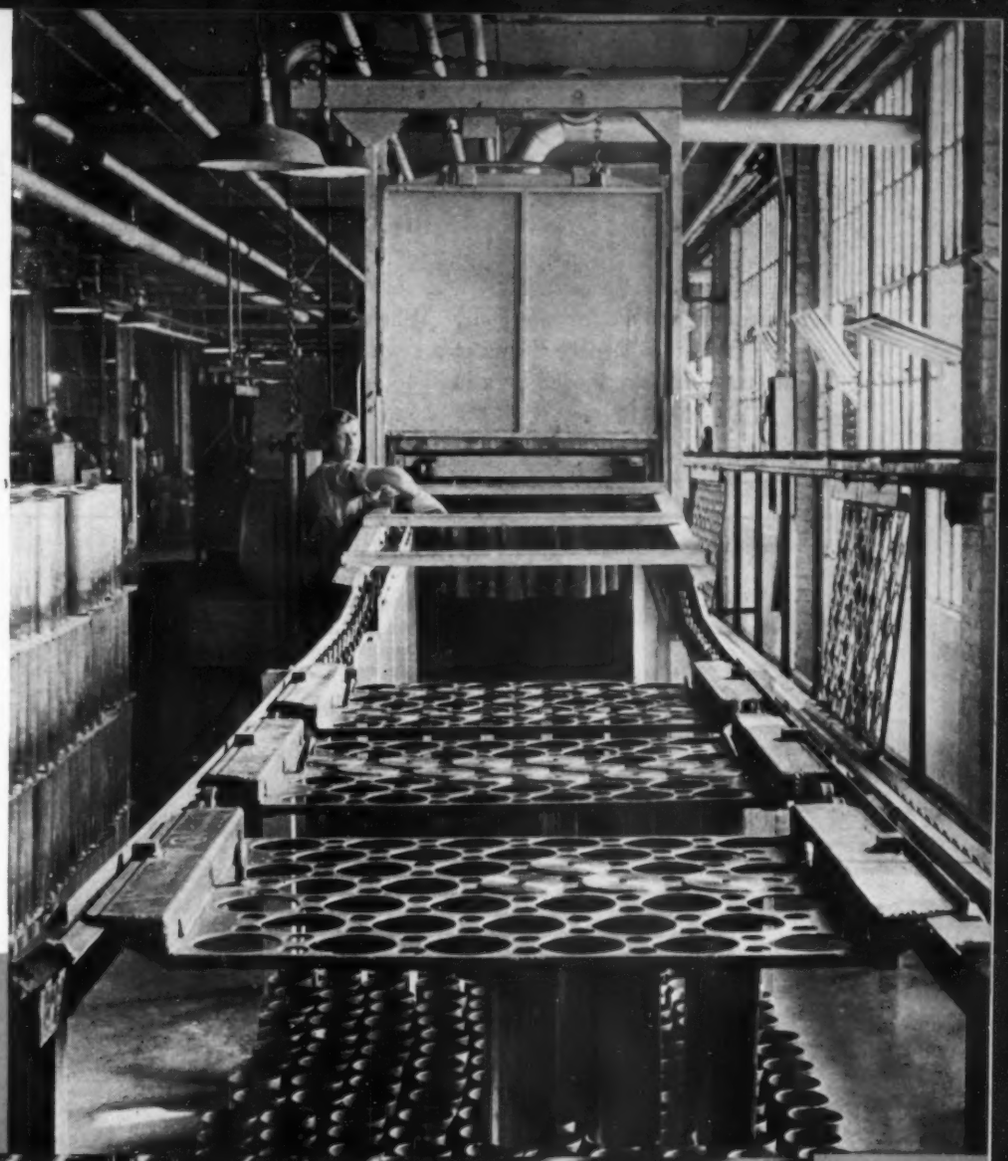
After machining, the cases are placed in flat racks and moved by electric hoist to a wash tank where



Heads are machined in a four-spindle automatic lathe. Here the primer hole pull is drilled, reamed and counterbored, while the head is rough and finished faced. Following this the cases are held in a special collet on a two-spindle drilling machine, where the case is trimmed to proper length and the open end chamfered. A special Coulter machine is also used, which not only machines the heads, finishes the primer hole and counterbore, but also trims and chamfers the open end

After machining, all cases are washed to remove chips, grease and dirt. The cases are held in these trays, open end down, to facilitate cleaning and handling by tram-rail hoist which runs to a final annealing furnace

When the cases have been machined and cleaned they are given a final anneal at 500 F. for one hour. The trays emerge from the furnace and travel down a long ramp, which permits the cases to cool without using excess floor space



Annealed cases are placed on a moving belt which passes in front of inspectors. From this belt the cases are transferred to another conveyor running in front of government inspectors. Approved cases are stenciled and packed in paper cartons for shipping to loading plants

grease and chips are removed. The hoist then carries the trays to the ramp of a Surface Combustion furnace, where the cases are given a final annealing treatment at 500 F. for one hour. When the trays emerge from this furnace the cases are washed while in the trays and are moved by a hoist to an operator who places them on a flat moving inspection belt.

After checking by factory inspectors, the cases are placed on another conveyor leading to government inspectors. Upon their approval the cases are stamped in a special press. Finally, they are packed in paper cartons for shipment to loading plants.

OPERATIONS IN DRAWING 105-mm. SHELL CASES

No.	*Operation*	*Equipment*	*Notes*
1	Cupping	250-ton HPM press	30x20-in. press area; 24-in. stroke; 900 in. per min. closing; 109 in. per min. pressing; 4¼-in. pressure stroke
	Wash	Water tank	
2	Anneal	First track of two-track continuous, pyrometer controlled, Continental gas furnace, using baskets of 25–20 chrome-nickel steel	2 hr. at 1,100 F.
	Pickle	Lead-lined tank	
	First rinse	Lead-lined tank	
	Hot-water rinse	Water tank	
	Cold-water rinse	Water tank	
3	First draw	200-ton HPM press	24-in. stroke; 830 in. per min. closing; 143 in. per min. pressing; 7¼-in. pressure stroke
	Wash	Water tank	
4	Anneal	First track of second Continental furnace	1¾ hr. at 1,100 deg. F.
	Pickle and rinse as before	Lead-lined and plain tanks	
5	Second draw	150-ton HPM press	36-in. stroke; 830 in. per min. closing; 194 in. per min. pressing; 11½-in. pressure stroke
	Wash	Water tank	
6	Anneal	Second track of first furnace	1½ hr. at 1,100 F.
7	Third draw	100-ton HPM press	30x30-in. press area; 72-in. stroke; 880 in. per min. closing; 280 in. per min. pressing; 18¼ in. pressing stroke
	Wash	Water tank	
8	Anneal	Second track of second furnace	1 hr. at 1,100 F.
9	Fourth draw	75-ton HPM press	30x30-in. working area; 72-in. stroke; 1,200 in. per min. closing; 390 in. per min. pressing; 30-in. pressure stroke
	Wash	Water tank	
10	Trim	No. 202 V&O automatic trimming machine	
11	Head and indent	No. 28 Bliss 1,200-ton toggle press	Two station machine with air-operated automatic case stripper; 6-in. stroke
12	Pierce primer hole	No. 24 Bliss Consolidated without bolster table	
13	Taper anneal	Lindberg cartridge case washing and annealing assembly with 43x43x42-in. salt-pot furnace, loading stand, elevating mechanism, two wash tanks, lowering mechanism, discharge stand with necessary air cylinders and controls	In saltpeter of 925–950 F. for 2 min.
	Wash in cold water		
	Wash in hot water		
14	Taper	100-ton HPM press with mechanical ejector in bed of press	30x30-in. press area; 72-in. stroke; 880 in. per min. closing; 280 in. per min. pressing; 15-in. pressure stroke
15	Machine head	No. 49 New Britain-Gridley four-spindle automatic	
16	Face open end	Leland Gifford 14-in. two-spindle drill press, air cylinders under table to operate collets	
15 & 16	Machine head and face open end	James Coulter 3-in. finishing machine — special	
17	Inspect	Bench	
18	Drill and tap two eyelet holes in base	Ettco special drilling and tapping machine	
19	Wash		
20	Final anneal	Continental continuous automatic furnace	1 hr. at 500 F.
21	Inspection	Conveyor	
22	Government Inspection	Conveyor	
23	Stamp	10–4 Minster press without bolster or table	
24	Inspect		
25	Pack		Paper cartons

Adjustment of Bevel Gears in Assembly—I

RECENTLY ADOPTED as recommended practice for the adjustment of bevel gears in assembly by the American Gear Manufacturers Association, the following instructions were developed from data furnished by the Gleason Works, Rochester, N. Y.

Mounting Bevel Gears

Every pair of gears represents an expenditure of much time and effort, both in design and manufacture. Corresponding care is required when the gears are assembled to obtain the full benefits of the work already done. The best gears that anyone can make will be unsatisfactory if improperly installed. Only with correct mounting will the maximum durability and strength be obtained.

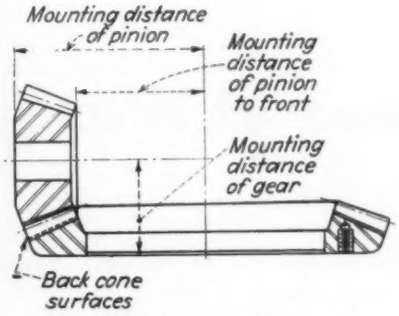


Fig. 1—Mounting distance

Mounting Distance

The axial position of a bevel gear or pinion is given by a dimension called the mounting distance, as shown in Fig. 1. This is the dimension from a reference surface on the given member to the center line of the mate. It is frequently more convenient to make measurements for a pinion when the mounting distance is to the front rather than to the back.

Backlash

Bevel gears are cut to have a definite amount of backlash which varies according to the pitch and operating conditions. This backlash is necessary for the safe and proper running of the gears. If gears are set up too tightly they will be noisy, wear excessively, and possibly score on the tooth surfaces. The amount of backlash required is usually etched or stamped on one or both members of a pair. If no markings are given, use the values listed in the accompanying table.

Backlash should be measured at the tightest point. In order to make this measurement, lock the pinion against rotation, rigidly mount a dial indicator against a gear tooth, being sure that the indicator is normal to the tooth surface as shown in Fig. 2. The backlash will then be shown by the indicator when the gear is turned back and forth. This is an important step because the backlash must be right if the gears are to be mounted correctly.

Installing the Gears

Before assembling a pair of bevel gears look them over, observe all markings, and read any tags which may be attached. The mounting distance is usually indicated as "M.D." followed by the dimension. Backlash is usually indicated as "lash" followed by the amount.

It is strongly recommended that gages be used to set the pinion at its correct mounting distance and that the gear be then set to have the requisite backlash as measured by a dial indicator. The methods used are explained in the following paragraphs. Bevel gears larger than 20 in. in diameter have their teeth cut to run best with the back cone surfaces flush. These gears can be satisfactorily assembled by setting them to have the back cone surfaces flush and with the proper backlash.

BLACKLASH TABLE

Diametral Pitch	Backlash (Inches)
2	0.012 — 0.016
3	0.008 — 0.010
4 — 5	0.006 — 0.008
6 — 9	0.004 — 0.006
10 — 19	0.002 — 0.004
20 — up	0.000 — 0.002

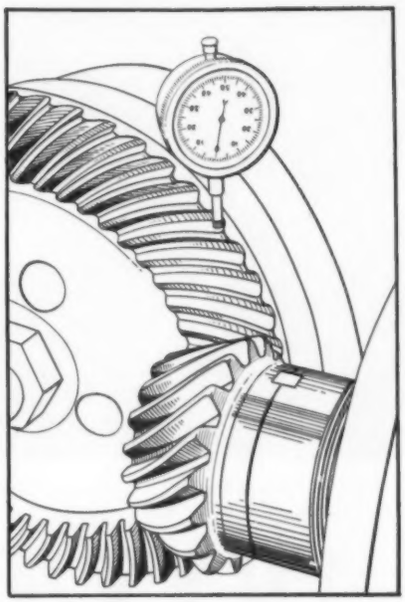


Fig. 2—Location of indicator when checking blacklash

The tooth bearing should always be checked before putting in the lubricant and running under load. The mounting is correct only when the proper tooth bearing and required amount of backlash are obtained. To check the gears, paint the teeth with a mixture of marking compound and a few drops of light oil, and run the gears under a light load. The tooth bearing will then show plainly.

Marked Teeth

Spiral bevel gears of exactly even or multiple ratios may have certain teeth marked *X*. These gears should always be assembled with the marked teeth together as shown in Fig. 3. This should

Fig. 3—Mating of marked teeth

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Adjustment of Bevel Gears in Assembly—II

also be done whenever such gears are put together after having been disengaged.

Mountings

It is assumed that the mountings will be rigid. When mountings allow excessive deflection there is danger that the loads may be concentrated at the end of the teeth, causing them to break. The shafts which carry the gears must be accurately located and set at the correct angle. In the mountings for spiral bevel gears, provision must be made to lock both the gear and the pinion against axial thrust in both directions, as under certain conditions either member may have an inward thrust.

Locating the Pinion

The position for mounting the pinion should be determined by measuring from the shaft of the mating gear. If the gear shaft does not extend in front of the pinion, a dummy shaft which accurately fits in its place should be used. The distance from the locating surface on the pinion to the gear shaft will be equal to the mounting distance minus the radius of the shaft.

The measurment may be made by means of micrometer gages, gage blocks, or by special gages prepared for that purpose. It is often more convenient to measure to the front of the mounted pinion, rather than to its back. In this way the mounting distance can be readily checked after the pinion is in place. Convenient points for measuring are shown in Fig. 4. The pinion can be located in correct position by a collar ground to the required thickness or by shims.

Locating the Gear

After the pinion is in place, the correct position of the gear may be accurately determined by moving the gear along its shaft and into mesh with the pinion until the specified backlash is obtained.

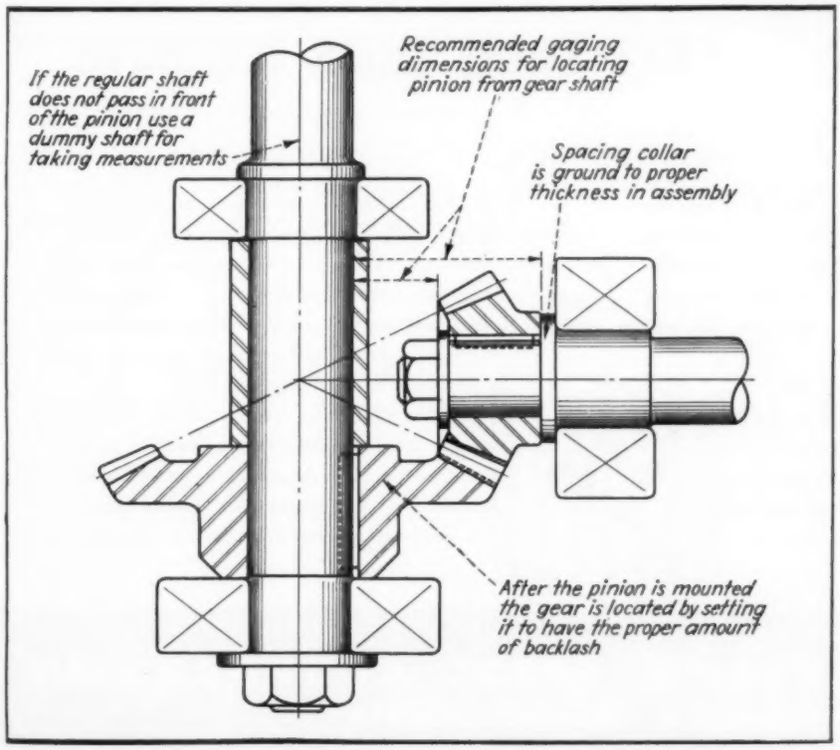
If the regular shaft does not pass in front of the pinion use a dummy shaft for taking measurements
Recommended gaging dimensions for locating pinion from gear shaft
Spacing collar is ground to proper thickness in assembly
After the pinion is mounted the gear is located by setting it to have the proper amount of backlash

Fig. 4—Measurements for locating the pinion. Measuring or gaging as shown above is the recommended method of locating the pinion

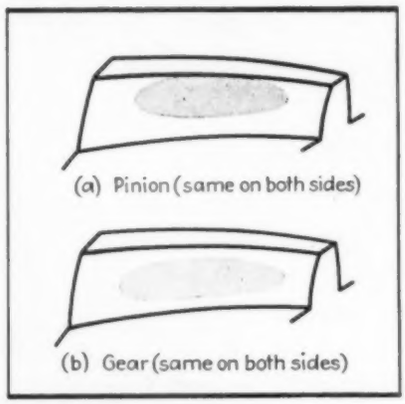

Fig. 5—Ideal bearings for spiral bevel gears

Checking the Installation

When both gear and pinion are fastened in place, the tooth bearing should be checked as already mentioned. The bearing on the teeth of correctly mounted straight bevel gears should be very similar to that shown in Fig. 8. Spiral bevel gears should have tooth bearings similar to those shown in Fig. 5. Inaccuracies in the mounting or assembling will change the tooth bearing on properly cut bevel gears as explained in the following sections.

Tooth Bearing of Spiral Bevel Gears

The ideal tooth bearing of spiral gears as shown in Fig. 5 differs from that of the straight tooth gears in that it is localized. It is slightly high on the pinion and low on the gear, and it does not extend all the way to the small end of the tooth. The length of the tooth bearing is usually about three-quarters of the tooth length, and is closer to the small end.

Because of the localized nature of the tooth bearing, the curved tooth gears are less affected by slight changes in mountings than straight tooth gears. However, special care should be taken when mounting curved-tooth bevel gears to take full advantage of their superior quietness and smoothness.

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Using What We've Got

AMERICANS have been a wasteful people. The fact that we have had at our command almost unlimited resources has contributed to our prodigality.

What if we did send our dinner plates back to the kitchen with only half the food eaten? What if we did burn up tremendous quantities of oil and gasoline and rubber on the roads with little thought of economy? What if we did a lot of things which called for needless expenditures of precious materials? We had plenty of them.

The same was true of equipment. At home we liked endless numbers of gadgets at our beck and call, though we might use them only occasionally. We might put to work some of our plant equipment only a small portion of the 24 hours out of the day, but we wanted it there all the time.

The time for such easy-going ways is definitely past, at least for the duration of the war. We can't have materials or equipment sitting around the plant unemployed these days. Not if we expect to win the war.

We must not be satisfied with giving our equipment an occasional job to do. We must keep it busy as close as possible to a round-the-clock schedule.

Manufacturers are devising ways and means of getting more out of what they've got. Take the case of a prominent steel company:

It has hundreds of machine tools in various mills which must be available almost instantly for maintenance and repair work, yet which are normally idle a good part of the time. The management said to itself recently, "why not utilize these machines for war work?"

The company got busy with the following results. It received government orders, on its own solicitation, for munitions parts. It became a sort of marginal supplier, its volume supplementing that of larger producers who were held strictly to account for specified delivery dates. The terms of its own contract were not so exacting, because it turned out munitions parts only while its equipment was not engaged on necessary mill maintenance and repair jobs.

This general procedure is working admirable. It is getting into active war service equipment which obviously is essential for maintenance and repair, yet has been unemployed for hours on end. The practice is being extended from one mill to another in the company's far-flung operations as war jobs can be found to fit machine requirements.

The experience of this steel company should suggest similar possibilities to other manufacturers. We can't have everything in this war brand new and made to order for us. We must be smart and resourceful in getting everything we can out of what we've got.

Burnham Finney

GAGING BUSINESS

WPB explains allocation to foreign purchasers. April bookings of machine tools more than capacity. Tank armor facilities expanded. 27 ships launched in single day

The job of tooling up the metal-working plants of this country for production of armament for the United Nations is far advanced. While much remains to be done before the full effects of the industry's war capacity will be felt, the volume of goods pouring out of U. S. metal-working factories is increasing at a most satisfactory rate. If the record to date can be taken as a forerunner of things to come, American industry will attain maximum war operations considerably ahead of the time figured on.

In fact, the capacity now at work is rapidly reaching the point where it will absorb all the materials available. The main problem shortly will be one of transporting goods from war plants to the fighting fronts around the world. The task of storing war products as they come off assembly lines also is taking much attention of ordnance officials.

Machine Tools—The War Production Board has issued a directive explaining how machine tools are to be allocated to various countries out of the 25 percent foreign purchase group set up under order E-1-B establishing a limited allocations system. The machine tools subcommittee of the Requirements Committee of the WPB allocates a certain portion of the 25 percent to the foreign group. Then the Lend-Lease Administration makes recommendations to the subcommittee apportioning the total for export among the various Lend-Lease recipient countries.

Upon approval of these recommendations by the subcommittee, the tools branch of WPB will direct the placement of purchase orders for tools by the Ordnance Division of the War Department. Upon these premises the Lend-Lease Administration, the tools branch of WPB and the War Department will devise a system for the most rapid placement of orders by Ordnance Department for foreign countries.

The placing of orders by the Ordnance Department will not be affected by the numerical preference list, but the preference ratings assigned to the various countries will apply. Some of these rating are "musts," not designated by the usual symbols, and are higher than AA (emergency). It is commonly understood that Russia just now takes preference over everything else. Under the set-up described, orders for foreign delivery will go to machine tool builders from the Ordnance Department of the Army, which will tell the industry how to spot the orders on their production schedules to cause least interference.

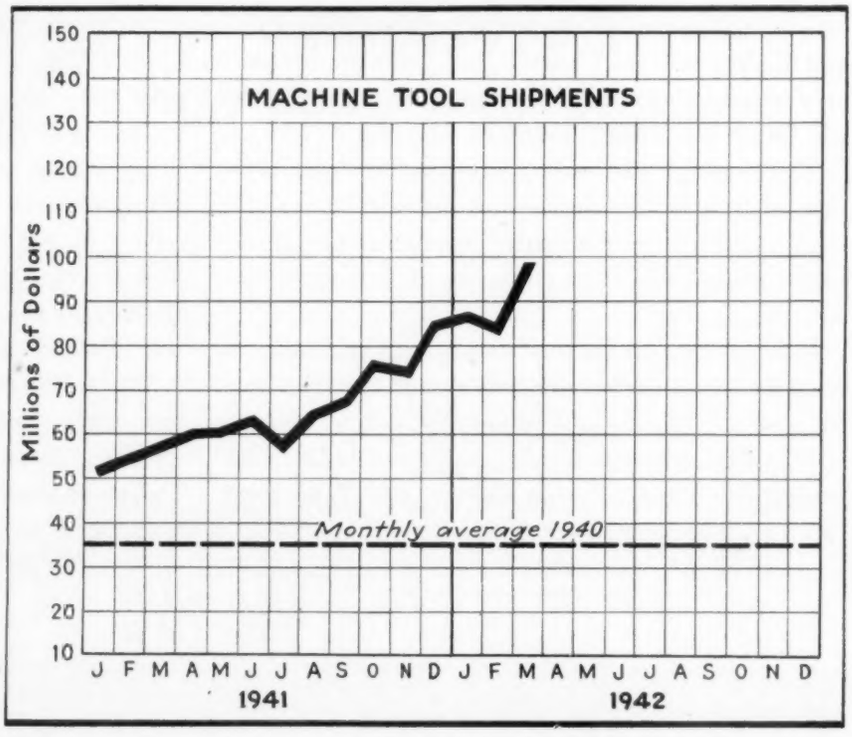
Despite the avalanche of machine tool bookings in March, the April volume was more than the productive capacity of the industry. The total incoming business in May also is estimated to be comparable with that in April. The fact is noted, however, that a few companies with new manufacturing capacity coming in are finally getting into a position where shortly production will be ahead of sales for the first time in many months.

When machine tool production figures for April come out, they are expected to show a gain over March, just as March did over February. There has been little change in the belief that output for the year 1942 will be around $1,600,000,000 as a maximum. That figure is twice the total for 1941 and almost sixteen times the volume for an average prewar year.

Steel—Facilities for production of armor plate for tanks will be expanded by Carnegie-Illinois to more than triple the present output. The plant was originally a tin mill and was converted in 1940 to manufacture of prefabricated armor plate. Cost of the expansion will be in excess of five million dollars. The armor sets produced consist of more than thirty pieces and are used in the newer welded tanks. The ship plate production of steel mills has been increased recently to a point where it is much nearer the amount needed by the shipbuilding program. Substitution of lower-content alloy steels for the higher alloys is progressing well. Military authorities are much more inclined now to put acceptance of steel on a basis of performance of the final fabricated war product than of the rigid specifications which heretofore have been insisted upon. The steel industry continues to run at virtually 100 percent of ingot capacity.

Industrial Gears—Sales of industrial gears last month were off 17 percent from March, but despite this they were still 29½ percent above April of last year. Even more impressive is the cumulative total for the year to date, which is 34 percent above the corresponding period in 1941.

Shipbuilding—National Maritime Day was marked by the launching of 27 ships with a total weight of 270,000 tons. Plans originally were for 30 ships to be completed during the day but production on three got so far ahead of schedule that they were launched a few days earlier and work started immediately on laying new keels. The President's schedule calls for a total of 23,000,000 tons of shipping by the end of 1943.



Shipments Soar—The value of machine tool shipments during March was $98,400,000, as reported by the Production Division of the War Production Board. This amounted to 24,300 units as compared with 20,307 units, valued at $84,355,000 in February

Emphasis Off New Plants, Materials Go To Production

Surge of plant expansion is over except to expand raw materials production. Ceiling in sight on arms production; no gamble on a short war, but final schedules drafted

By ROBERT COLBORN

WASHINGTON—The War Production Board, from now on, will be casting a much fishier eye on the creation of new munitions plants. There has been no flat stoppage of new plants. More will be built—to open up bottlenecks or provide for particular new weapon requirements. But the big surges of plant expansion—like the billions of dollars worth that have been put under contract in the months since Pearl Harbor—are over.

The new policy applies to plants producing munitions—tank factories, shipyards. It does not apply to expansion of raw material. There will be no let up on synthetic rubber, high-octane gas, magnesium, aluminum. There will be re-doubled effort at increased extraction capacity in the mines.

Over steel there's dispute. Influential voices are urging continued expansion. Others suggest concentrating on blast furnaces to provide artificial scrap. Some, even among the all-outers, argue that steel production is in area of diminishing returns, that additional capacity isn't worth the effort required. There's doubt whether manpower will be available to make and cut up additional steel.

Behind the new trend is the fact that arms production is within sight of its ceiling. This is good news not bad. It does not mean that output won't rise during the coming year to three and four times present levels. It does mean that in less than two years we have been able to lay down the plant required to convert this country's entire resources of material and manpower into killing equipment. It means the schedules we are now working on are, by and large, the final schedules. You won't wake up another morning to find the bogie has been doubled or tripled.

Mass Production in High

It's no surprise that there is a ceiling. There's a limit to what any country—with given population and skill and natural resources can produce. Germany reached the limit several years ago. In fact U.S. and British experts think German production began to decline last July. The United States has already hit and pierced the German ceiling, is zooming toward a far higher one of its own.

The surprise is the speed with which we are getting there. The potentialities of mass production have amazed even the experts in mass production. This country has never had real mass production before. The production men have always been limited by the market. Now for the first time we have thrown in the switch and left it in. And the rate at which we can chew up metal is like nothing on earth.

Ease Off Plant Expansion

This is why the decision has been made to ease off on further plant expansion. To supply the plants now working plus the plants under construction or contracted for will take all the materials we can provide. When the battlefields start chewing up manpower, it may be all we can do to man these plants. There is no sense in building plants merely to stand idle. If the shipyards were not howling for steel, it might be worthwhile to build a few extra factories just to be on the safe side. But when we're aiming to get the most out of every pound of metal we've got to do close figuring.

The decision is not, as sometimes represented, a gamble on a short war. Washington is optimistic these days—but not to the extent of putting all the chips on one hand. The decision is dictated by the simple arithmetic of tonnage and man-hours.

For the machine tool and machinery-building industries the new situation has important implications. It means that the end of their big war job is in sight. They will be kept working at their most frenzied speed for the rest of the year by existing backlogs. But by 1943 the pressure should be off. Not that there won't be plenty to do. The mere job of keeping war plants retooled for new designs of tanks, guns, planes and such will be a big one. But every day won't see the backlogs bigger than the day before.

To prevent dissipation of material in unnecessary plant expansion tighter control is to be exercised over assignment of priorities on capital equipment. Plans now being worked out provide that instead of granting project ratings on a new plant that can be applied in buying anything needed, ratings will be limited to definite equipment and buildings. More drastic, there will be a crackdown on the power of the Army and Navy procurement officers to grant ratings on new plant; this job will be concentrated in WPB. In terms of the priorities system, the present P-19 and PD-3A ratings on new facilities will be replaced by a limited P-19.

CANADA RESTRICTS STEEL

OTTAWA—The Department of Munitions and Supply has issued instructions that no sheet, plate, bar or structural steel may be shipped by a mill without authorization of the Steel Controller. Thus it will make available this material for war needs before civilian requirements are met.

Earn While They Learn—As contractors hurry the erection of a new wartime plant for General Electric, girls are trained in a nearby garage, vacated by wartime restrictions on car sales. When the new factory is completed, experienced workers will be ready to take over the job of producing important equipment for army bombers

Induction of New Officers, Production Methods Feature Gear Manufacturers Meet

HERSHEY, Pa.—Induction of new officers featured the 26th annual meeting of the American Gear Manufacturers Association, held here May 10, 11 and 12. John H. Flagg, Watson-Flagg Co., became president, while R. C. Ball, Philadelphia Gear Works, was elected vice-president and L. R. Botsai, Westinghouse Electric and Manufacturing Co., treasurer. New members of the Executive Committee include A. G. Kessler, Farrel-Birmingham Co.; L. H. Schrade, D. O. James Mfg. Co.; D. T. Hamilton, Fellows Gear Shaper Co.; T. J. Bannan, Western Gear Works; W. H. Kinkead, Link-Belt Co.

McQuiston Retires

At the annual dinner, J. C. McQuiston whose retirement as secretary-manager of the association was announced in the May 14 issue of AMERICAN MACHINIST, was the recipient of many tributes to his leadership and service to the gear industry. He was selected to receive the Connell Award, establishment of which in memory of the late Edward Connell of the Falk Corporation was announced at the meeting. This award will be made annually to the man who has rendered the greatest service to the gear industry. E. W. Miller of Fellows Gear Shaper Co., past president of the A.G.M.A. in presenting a testimonial book containing personal messages to Mr. McQuiston from members recalled the part played by Mr. McQuiston in founding the Association, and the great growth in membership and influence under his managership during the past decade.

Guest speaker at the dinner was Dr. Lillian M. Gilbreth, who gave an inspiring talk on "Skills and Satisfactions."

Production methods featured the technical sessions. Too little thought has been given to ways and means of obtaining maximum production in the field of heavy industrial and other special purpose gearing, said George P. Maurer, of the Falk Corporation in discussing "Gear Production by the Hobbing Process." Although the general ease or difficulty of manufacture has always been considered in a rough way, the emphasis in design and building has been placed on other factors, such as compactness, capacity, efficiency and accuracy. We have devoted our efforts to refinement, to obtain the ultimate in performance, and if refinement resulted in additional work, the extra time required was shrugged away and considered to be well spent.

It is a simple matter, Mr. Maurer said, to arrange for around-the-clock performance of hobbing machines, since they require little attention, except during the set-up period. By taking advantage of every minute when machines must be down for maintenance to go over all portions of the machine and put it into first class shape, lost time because of breakdowns can be greatly reduced.

Reducing Cutting Time

Difficulty is encountered in trying to decrease the cutting time because the manufacturer has no experience which will tell him how far he can go in reducing cutting time and still achieve the minimum degree of precision which will insure that an important set of gears will operate satisfactorily under the imposed conditions. With close coordination between the engineering department and the shop, however, some increased production by this method can be made.

We still find many false conceptions of metal-cutting tool action, Dr. Ercole Mario Martellotti, of the Cincinnati Milling Machine Company, said in discussing "Physics of Metal Cutting." Studies of the process of chip formation under various conditions and with various materials were made by taking motion pictures through a microscope. The chips obtained under varying conditions were grouped in three classifications: the discontinuous chip; the continuous chip, continuously escaping compressed layer adjacent the tool face; and the continuous chip, with "built-up" edge adjacent to the tool face.

"Cutting Gears and Other Parts with a Reciprocating Generating Tool" was the subject of a paper by G. H. Sanborn of the Fellows Gear Shaper Co. Although this type of tool has been most extensively developed in the gear field, it has found an important place in the production of irregular-shaped gun parts, airplane cams, connecting rods and other parts. Mr. Sanborn illustrated the principles of the reciprocating type of generating tool, and discussed some of the possible applications.

H. E. Kitchen, of the Farrel-Birmingham Co. Inc., discussed methods of "Cutting Gears in Farrel-Sykes Gear Generators." In this machine, double helical gears can be generated with continuous teeth. This is done by taking alternative successive cuts on each heli and increasing the depth of cut after each rotation of the blank.

Award of Merit—At the annual meeting of the A.G.M.A., a testimonial book containing personal messages from members was presented to J. C. McQuiston, (right) retiring secretary-manager, by E. W. Miller, past president

New Officers of Gear Manufacturers Association

JOHN H. FLAGG

R. C. BALL

Industrial Truck Sales Up

CHICAGO—Domestic bookings of electric industrial trucks totalled 376 units in March according to the Industrial Truck Statistical Association. Total March value of chasses was $1,664,988, compared with $1,495,730 in February.

INVENT WITH A "V"

WASHINGTON—The Department of Commerce is distributing posters calling on Americans to "Invent for Victory." The posters call on all Americans who have an invention or an idea which might be useful to their country to send it immediately to the National Inventors Council, Department of Commerce, Washington, D. C.

Major General Campbell Made Ordnance Chief By President; Will Replace Wesson June 2

WASHINGTON—Major-General Levin H. Campbell, Jr., has been nominated by President Roosevelt to become Chief of Ordnance of the United States Army. He will succeed Major-General Charles M. Wesson, who retires from office on June 2 at the expiration of his tour of duty in that position.

The appointment was made after the President had withdrawn the nomination of Major-General James H. Burns. It is understood that Harry Hopkins made representations to the President that General Burns is irreplaceable in his present lease-lend activities with the Munitions Assignment Board. It was on that basis that General Campbell was nominated to the post for which General Burns was originally selected.

General Campbell's career is unique in that he first trained as a naval officer, being a graduate of the Naval Academy in the Class of 1909. He entered the Army as a Second Lieutenant in 1911 and in the First World War attained the temporary rank of Lieutenant Colonel while holding a Captain's commission.

His recent rise has been little short of meteoric. He made an enviable record as a Lieutenant Colonel in charge of small arms ammunitions production at the Frankford Arsenal. Shortly after the defense program began, he was called to Washington and placed in command of new ordnance facilities construction as a Brigadier General. Last January he was made head of the Production Division of the Ordnance Department and last month was elevated to the temporary rank of Major-General.

General Campbell is popular with the many executives in the metal-working industry, particularly the machine tool industry, who know his fine record.

MAJOR GENERAL LEVIN H. CAMPBELL, Jr.

OPA Exempts Munitions From New Price Ceiling

WASHINGTON—The extent to which military purchases shall be governed by the price ceilings established by the office of price administration is a subject now agitating government officials. As a first step toward clarifying the situation, OPA has amended the general maximum price regulation to exempt munitions purchases and several other types of government transactions. Meanwhile the same issue is being studied in connection with the broad machinery price regulation, which freezes the price of nearly all types of machinery at levels of last October. Scheduled to go into effect May 18, the machinery regulation has been postponed to June 1 while the problem is worked out.

Exempted from the general price freeze are all government purchases of combatant equipment and explosives or parts or subassemblies of such goods. Also any ship or boat or complete airplane. Prices in connection with developmental or experimental contracts are exempt as are emergency purchases which are either for repair and maintenance of combat equipment or amount to less than $1,000. Sales to the Metals Reserve Co. of metal, ore, or nickel-bearing or aluminum scrap are exempt.

Other government purchases are covered by the regulation—i.e. are frozen to March price levels. In order to avoid interference with production, OPA has set up a special rapid appeals mechanism for government purchases. Whenever it appears that the price ceiling will impede production under a particular contract, an appeal may be filed with OPA—S—as soon as the appeal is filed, contracts and deliveries may be made at the higher price. However, if the appeal should be rejected, contracts must be revised and refunds made.

One change which has already been made in the machinery regulation liberalizes the requirements on installation charges. Where as the machinery order requires that all prices be either the October price or a price computed on the basis of October costs, the amendment permits computation of installation charges on the basis of March, 1942 costs for field labor and outbound freight.

William K. Frank Heads New Resources Protection Board

WASHINGTON—A Resources Protection Board has been named by Donald M. Nelson, chairman of the War Production Board, which will evaluate the relative wartime importance of all industrial plants, war installations, facilities and vital economic resources and make recommendations for their protection. William K. Frank of the Production Division has been appointed by Mr. Nelson to act as chairman of the organization.

The new board will cooperate closely with the army and navy, the Maritime Commission and Office of Civilian Defense in furnishing ratings and recommendations by which they may be guided in planning the protection of resources. Study will be made of the relative importance to the war effort of all plants, facilities and natural resources. It will act as a clearing house for all information bearing on the security of resources and installations.

Canada Joins Armament Pool; Washington Has Removed Difficulties; Restrictions Tightened

OTTAWA—Canada has decided to put its armaments production into the joint munitions pool and to sit with Great Britain and the United States in the Munitions Assignments Board at Washington which will make munitions assignments to United Nations out of the pool. The decision has been made by the Ottawa government on assurance from Washington that Canadian production will not be impaired through lack of hard money exchange with which to procure raw materials and tools in the United States. Ottawa had hesitated to enter the pool because it feared pooling might cut off payment for Canadian munitions supplied United Nations and thereby destroy Canada's ability to buy necessary supplies in the U. S.

Effect of Participation

The terms of Washington's assurance permitting Canada to participate in the pool without prejudice to its war production have not been revealed at the time of writing but the effect is to guarantee Canada payment for armaments turned over to the pool at least up to the amount required by Canada for war buying in the United States. This does not necessarily mean that the U. S. treasury will pay for all Canadian armaments going into the pool for assignment to units of the United Nations. Canadian armaments already ordered by members of the United Nations will go into the pool and may be assigned to countries other than those which originally ordered them, but they will be charged to the latter countries. Anti-aircraft guns, for example, ordered by Britain from Canada will go into the pool and may be assigned to Russia but Britain will be responsible for payment to Canada.

One outstanding effect of Canadian participation in the pool is that Canada's billion dollar outright gift of war supplies to Great Britain becomes a gift to the United Nations. The gift to Britain was announced by Ottawa a few months ago. This billion dollars' worth of armaments will be delivered by Canada to the pool without charge and will be distributed to United Nations according to decisions of the assignments board.

Original proposals for removing difficulties in the way of Canada's entry into the munitions pool included plans for wiping out the exchange differential between Canadian and U.S. funds but Ottawa turned these down. Canadian financial authorities do not want exchange parity because of heavy losses it would involve for this country and because it would tend to stimulate non-war buying in the United States. Parity would wipe out the 10 percent premium received by Canada on payments for Canadian exports to the U.S. By increasing the value of the Canadian dollar in relation to the sterling pound it would also lower returns to Canada from heavy sales to Great Britain. While parity would lower the cost of imports from the U.S. affected by the Canadian price ceiling and save on the cost of subsidies to bring them under the retail ceiling. Ottawa figures that this benefit would be largely washed out by an increase in the volume of imports. As it is, the price ceiling administration has withdrawn the ceiling subsidy from a long range of commodities on which source prices are now frozen by the U.S. manufacturers' and wholesalers' ceiling.

Alternative to Parity

As an alternative to parity, Ottawa has been examining a proposal for confiscation by the federal treasury of the exchange premium on payments for Canadian exports to the U.S. Decision is not final, but if confiscation is to be resorted to, Canadian exporters probably will be notified in Finance Minister Ilsley's annual budget statement.

CIO Program

Ilsey's new taxation legislation has not been finally formulated but is pretty certain to include steep increases in the national defense tax—an additional income tax designed to drain off excess wartime earnings of workers but which applies to all incomes.

C.I.O. is seeking to organize the bulk of Canada's war production industry. Its current method is that of making charges in newspaper advertisements and radio broadcasts that machinery is idle in various war plants through the fault of the management and that war production is thereby kept below capacity and workers left idle. These charges are made the basis of demands for labor-management councils on plant operation and control. Members of the Ottawa government, including Munitions Minister Howe and Labor Minister Humphrey Mitchell, and dollar-a-year munitions production chiefs are supporting the proposals for labor-management bodies on conditions that they devote their efforts to increasing production and not to interference with wage levels.

Current Canadian restrictions and curtailments in the metal working industries correspond to those made in the United States, going further in some cases. One of the latest control orders prohibited the use of any metal other than silver or gold in the production of an extensive list of non-essential commodities. This week the number of sizes and varieties of cast iron soil pipe and fittings was ordered reduced from 1250 to 360 for an estimated saving of 4000 tons of metal, enough to build 250 tanks. Most of the plants whose production of consumer goods (stoves, refrigerators, washing machines) has been either wiped out or drastically cut have obtained subcontracts.

MOVIE SHORT ON STEEL-MAKING

PITTSBURGH — Allegheny Ludlum Steel Corp. has produced an inspirational film entitled "There's a Job to be Done" which is accompanied by a special musical score and impelling narration. It will be given a nationwide showing. Donald M. Nelson, chief of the nation's war production drive, has opened the movie with a strong message to all Americans. The film then goes into the various phases of alloy steel-making and shifts to the use of these products in ships, guns, shells, planes and tanks of the fighting front.

"Production for Victory"—Fulton Lewis, Jr. interviews D. G. Millar, president of the Greenfield Tap and Die Corporation, during a broadcast from Greenfield's gage plant. The program was one of a series sponsored by the National Association of Manufacturers entitled "Production for Victory"

INSIDE DETROIT

WPB creates field organization to speed subcontracting to smaller manufacturers; subdivision of Detroit regional office. Protests greet price squeeze on machines, parts

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—To speed subcontracting of munitions among the smaller manufacturers, the Detroit Regional Office of WPB has created a field organization with the following responsibilities: (1) to work closely with the metal-working plants within a limited area and thereby attain an intimate knowledge of their facilities, (2) to find and catalog all unused machine equipment within that area, (3) to match material wanted by prime contractors and some 70 government agencies with unused facilities, and (4) to assist subcontractors with engineering and shop problems, aid them to get needed machine tools, fixtures, cutting tools and materials.

The region under the jurisdiction of the Detroit Regional Office consists of the lower Michigan peninsula and Lucas County (Toledo), Ohio. This area has been split into seven zones, over which there will be senior engineer. Grand Rapids and Toledo will have resident senior engineers, the other five areas will be covered out of Detroit by the official in charge. But each zone will have from three to a dozen or more field production engineers who will travel constantly from plant to plant within the area.

The idea behind this program is to give personal service to the manufacturers within a zone, instead of requiring them to come to Detroit for assistance in getting sub-contracts or with production problems. Each field production engineer will carry a list of orders which he believes can be placed within the zone. This list will be culled from "War Production News" a publication put out twice weekly, showing material wanted by prime contractors and the various government buying agencies. Sample blueprints and parts will also be carried for display to potential subcontractors.

Subcontractors Job

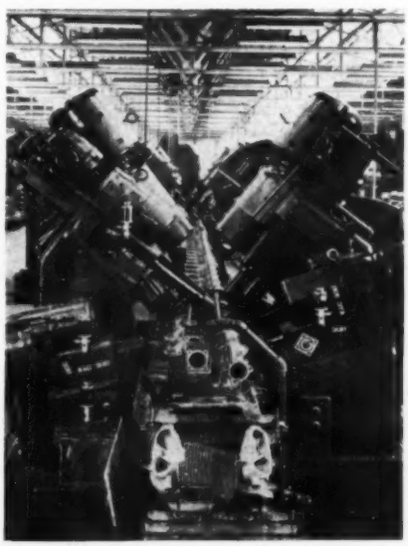
Prime contractors within the Detroit area have been trying to subcontract a high percentage of the amount of work involved—tools, jigs, fixtures, gages and production parts. The rearmament job is too large, however, for the prime contractor to be solely responsible for seeking out sources for subcontracted work. It's up to the smaller plants to display some ingenuity and hard work. As Harold P. Valentine, regional supervisor of the planning and procurement section, Detroit Regional Office, WPB, says:

"Our main objective in the Detroit regional office is one of service. We want to work with you manufacturers to the end that all **usable** plant facilities will be put to war jobs 24 hours a day, seven days week. We at WPB do not buy or sell, nor do we place contracts. Our job is to work with you men to meet the needs of our Armed Forces, to bring buyer and seller together.

"But WPB's part in bringing buyer and manufacturer together is only about 20 percent of the effort. The other 80 percent represents hard work on the part of the manufacturer in determining the right type of war work for his shop, and then converting and adapting the shop to handle it. Going after a war contract is no different than going after private business in normal times. It requires the same hard work and the same ingenuity on the part of the manufacturer before he can make and sell an acceptable product.

"There are three steps plant owners must follow to improve chances of getting war orders. First, fill out on a special WPB form on inventory of plant and facilities; second, keep WPB informed, as a plant nears completion of one job, about when it will be available for another; and third, advise WPB when a war order is obtained, so that WPB field men need not waste effort seeking work for a plant already occupied."

Creation of a field organization of this type marks the first time that further decentralization of WPB activities has been attempted since Donald Nelson originally created thirteen regional offices. Directors have been appointed for seven of the regions. Since Detroit was the first region to be established, its method of operation may prove a model in other territories.



War Monster—This automatic cylinder head transfer machine is one of the high production units installed recently by the Wright Aeronautical Corp. It is 154 feet long and combines the work of 39 older machines

Price Squeeze

Automotive war subcontractors have been appalled at the implications of Maximum Price Regulation No. 136—"Machines and Parts." Fathered by the Machinery Section of OPA, the regulation has been construed in Washington as applying at least to parts made for military trucks on the grounds that a truck is a machine. Prices that might be charged for such material are to be set back to the Oct. 1 level, regardless of two or three rises in materials and labor costs experienced since that date. It is a moot question in the minds of local people whether OPA might also attempt to apply its order to parts and tooling for armament and aircraft engines. In which case hundreds of suppliers outside of the automotive parts industry would be affected.

The storm of protest aroused by the Machinery Section's action caused Leon Henderson to postpone the effective date of the order to June 1 and to announce that an amendment affecting the coverage of parts and sub-assemblies important to the war production program will be announced shortly.

Evidently OPA is seeking to curb the inflation spiral by striking at parts costs. Materials prices are already frozen. The prices charged by prime contractors for assembled trucks, aircraft munitions are subject to negotiation between the prime contractor and the services and can't be reached by OPA. Just why the Oct. 1 price level was chosen for parts is unknown in Detroit, but it is suspected that the gentlemen's agreements reached last fall by the Machinery Section and certain builders of machinery influenced the choice. Protests against that date, in view of increased manufacturing costs since, have brought forth the suggestion from Washington that perhaps some date in January might be more appropriate.

In usurping the province of the Automotive Section of OPA, the Machinery Section may have disregarded the heterogeneous nature of the parts industry. Pricing policies are extremely diversified. Some companies survey costs frequently, others semi-annually and adjust prices to suit. Some make

standard items in mass production, taking a small profit on business done with major automotive customers. Others produce in jobbing lots for the wholesale trade, with a wider margin of profit. Most parts makers are today working largely for war purposes. In the case of universal joints and carburetors for military vehicles, design changes are made frequently, necessitating a complete new processing layout and possibly new materials, with the result that there is no practical basis of comparing costs with the October level.

So far as the parts industry is concerned, no single government action since long before Pearl Harbor has produced the confusion aroused by Order No. 136. Representatives of the industry were in Washington last week to seek the development of a pricing policy that will not force many of them out of business. The action to be taken by Henderson in the promised amendment will be worth watching by war subcontractors.

PRP Grants Quarter-Year Rating on All Materials

WASHINGTON—When the third quarter of 1942 starts July 1, most manufacturers entitled to priority ratings will be getting their materials under the Production Requirements Plan—a priority scheme which is on its way to becoming an over-all system of material allocation. PRP started out as simply a way of helping firms not entitled to a blanket rating, but, as predicted by AMERICAN MACHINIST (*AM*, March 19, p. 248c), it is now the standard scheme for distribution of materials to manufacturers.

Definite Quantities Rated

Essential feature of PRP is that a manufacturer is granted a rating on definite quantities of all the materials he uses to meet his requirements for a quarter-year. The assignment is made on the basis of an elaborate application form, PD-25-a, in which is set forth the orders on the books and their priority ratings, the estimated material needs for the coming quarter. Originally considerable stress was laid on careful reporting of orders on the books broken down by the priority ratings attached to the orders. This was because PRP was seen at first as a more or less mechanical device for converting the ratings on a man's orders into a rating to be attached to his purchases. The particular ratings of the orders on a manufacturer's books don't matter as much as the importance of his product to the war.

WPB therefore announced this month a substantial simplification of the PD-25-a form, eliminating most of the information about the ratings of the applicants' orders and making several other technical changes. Firms starting to use PRP in the third quarter will find the jobs much simplified. Firms which have been using it right along should get hold of the new set of directions for making application.

Now that the form has been simplified, use of the special simple version, PD-25-x, which was previously available to firms doing a business of less than $100,000 a year, has been discontinued.

WAR ORDERS IN BRIEF

AIR CONDITIONING—New installations of air conditioning and commercial refrigeration equipment have been banned except to meet war and essential civilian requirements. (Limitation Order L-38).

AIRCRAFT PARTS—Suppliers of material used in production of aircraft may apply an A-1-a rating for those operating supplies absolutely necessary in processing aircraft parts which they furnish on ratings assigned by the order. (Amendment 1, Preference Rating Order P-109).

ALUMINUM—Stocks of supplies made of aluminum in hands of wholesalers and distributors are removed from restrictions of the Suppliers' Inventory Limitation Order L-63. (Exemption No. 4).

ALUMINUM PLANTS—Suppliers of materials used in construction of vital aluminum and magnesium plants have been advised that deliveries should be made on schedule even though subsequent orders carry higher preference ratings assigned under original order. (Interpretation No. 1, Preference Rating Order No. P-19-i).

AUTOMATIC PHONOGRAPHS — Manufacturers having on hand inventories of raw materials and semi-processed and finished parts, frozen by terms of original order, are now permitted to dispose of such inventories to fill orders bearing preference ratings higher than A-2. (Amendment 1, Supplementary Limitation Order L-21-a).

AUTO PARTS — Producers may make during period April 1-June 30, and period June 30-September 30 seventy percent of total dollar volume of replacement parts sold by them in corresponding quarter of 1941. This production quota is accompanied by certain restrictions on inventory of finished parts. (Supplementary Limitation Order L-4-c).

BRASS—Shipments of brass mill, wire mill and foundry copper products have been limited to ratings of A-1-k or higher unless specific authorization is given for a lower rated shipment. (Amendment to Preference Order M-9-a).

COPPER—The use of copper and its alloys, including brass and bronze has been curtailed in additional civilian products on list A-1. The previous list is maintained in substantially the same form. (Conservation Order M-9-c). Person who has frozen brass mill or wire mill products may sell them to any such mills without obtaining approval. Locks have been placed on list A-1. (Amendment to Conservation Order M-9-c).

INDIAN KYANITE—Delivery, consumption and processing of this refractory material, both future imports and present stocks in U.S., are subject to specific authorization. (Conservation Order No. M-143).

COPPER SCRAP—Ingots have been included in Supplementary Order M-9-b, and Form PD-459 is provided for monthly reports from foundries which melt scrap or ingots and is due in Washington before the 10th of each month.

HAND TRUCKS—Delivery of this equipment with rubber tires forbidden except in specific cases. For 90 days deliveries may be made to Army, Navy and Maritime Commission. No one may deliver rubber tires for hand trucks, pending OPA rationing program except to truck manufacturer with approval of WPB. (Order L-111).

MACHINES—October 1, 1941 prices on machines and parts, established as maximum price schedules, becomes effective June 1. (Amendment 2, Regulation No. 136).

METAL FURNITURE—Iron and steel contained in inventories of mbanufacturer, provided worthless for any other purpose, may be used. Change also permits production of venetian blinds containing less than 15 oz. (Amendment No. 2, Limitation Order L-62).

OUTBOARD MOTORS — Sale or lease by manufacturers of motors 6 hp. or more to Army, Navy, Maritime Commission, and other specified government departments is permitted. (Amendment No. 1, Limitation Order No. L-80).

PLANT LEASING — Manufacturers cannot escape responsibility for scheduling deliveries in accordance with preference ratings by leasing their plants or making products under a toll agreement. (Interpretation 1, Sect. 944.2, Priorities Regulation No. 1).

PLUMBING—Use of lead and zinc as a preserving finish on plumbing fixtures and trim has been allowed. (Amendment No. 1, Schedule VII, Limitation Order No. L-42).

SAFETY EQUIPMENT—Except for specified application, use of critical metals, asbestos cloth, plastics, and rubber is forbidden in manufacture of safety equipment on priority ratings lower than A-2. Exception made for 90 days on deliveries to Army, Navy and Maritime Commission.

SPERM OIL—This oil has been placed under complete allocation control. Application for use, process and delivery should be made on Form PD-481. (Amendment 1, Preference Order No. M-40).

STEEL—Production of alloy iron and steel will be subject after June 1 to monthly melting schedules to be issued by the Director of Industry Operations. (Amendment No. 3, Supplementary Order M-21-a).

ZINC—Metallic zinc has been placed under complete allocation control. (Supplementary Order M-11-a).

WARTIME WASHINGTON

End of war may be in sight; Churchill confident. Plant expansion levels off. Few questions regarding machine tools allocation. More about the Higgins Ship Line

BY BLAINE STUBBLEFIELD

WASHINGTON — For the first time, since September 1, 1939, the possible end of the war is in sight. This vision of defeat for the Axis perhaps next year may be only a mirage. It might fade out and the fighting might go on and on. But today several factors add up to a greater total of hope than ever before.

Churchill says we are not over the ridge yet but we can now see over it for the first time.

German airplane losses are now running at the rate of one in ten of all they send into combat. That is a deleterious rate which the Nazis are in no position to endure.

According to Churchill, the Germans have already lost more men, nearly two million, than they lost in the entire World War. Correspondents who see the Germans say they are getting gray-faced and irritable.

Finally, the United States is leveling off its war plant expansion—going ahead with expansion of materials production but putting all metal-working capacity directly onto munitions. This does not mean that we are abandoning long-range planning. Nor does it mean that we are taking a long gamble on a short war. It does mean, as Nelson has said, that we want to make short work of it and end the world's misery if possible, and it means that the Axis is making a desperate pass at our jugular now, and it's a question of ours or theirs.

United Nations production of war gear, with the United States far in the lead, is making that of the Axis look puny.

We and our allies have air superiority on three fronts: in Russia, over the English channel and Europe, over Australia; while the enemy retains it only over the Eastern theatre.

United States production of planes is now in excess of 3300 per month, the last official figure, while that of Germany and Italy is now scaled down, by the best informed guessers, from around 3000 per month to somewhere between 1100 and 2500. There is no new figure on Japan, the last being between 300 and 500 per month.

Aircraft Training Report

Forty automobile firms are being trained in mass production of plane parts and aircraft engines by the "old line" aircraft industry.

This program is beginning to show satisfactory results, says the Aeronautical Chamber of Commerce, because the aircraft industry is placing its designs and technicians at the disposal of the auto industry. The program was started two years ago.

Pratt and Whitney sent 50 top-ranking executives to Ford and Buick, and Glenn Martin invited Ford to send selected personnel to a basic training school at the Company's Baltimore plant. Boeing maintains a staff of 50 inspectors at auto plants making B-17 parts.

It is interesting to note the aircraft industry's efforts, by use of such terms as "old line" and "regular" to retain its identity in the vast aircraft facilities scramble.

Questions Annent Allocation

WPB machine tool section executives appeared mildly surprised at the few questions that followed allocation order E-1-b. Likewise the Machine Tool Builders Association appears to have received fewer inquiries than expected.

Materials Man—A. I. Henderson has been appointed Director of Materials of the WPB. He has been deputy director of the division, serving under William L. Batt. Pressure of work as chairman of WPB's Requirements Board and as U. S. member of the United Nations Materials Board forces Batt to withdraw from the Materials Division

Previously, some dismay had been expressed about the voluminous and complicated order.

Only one interpretation had been issued by WPB at this writing. This document says that purchasers must include in their orders to manufacturers such specific details as will enable the producer to place the order in his production schedule.

Some prospective purchasers have advised builders of their intention to buy certain types, but descriptions have been in such vague terms that the order could not be scheduled. While the builder is waiting for the necessary detail, other orders come in, specifically stated, and must be entered ahead of the previous ones.

Exact orders are required, because the allocation directive sets up complete categories of tools by types and sizes, allocating set percentages of each by months. The builder cannot accept a request such as "Put me down for some grinders."

Air Transport Expands

Aircraft are about to play a new role in the world air war. Information is unofficial so far, but the Army is preparing to move personnel and cargo aloft on an unprecedented scale.

This development divides into two parts: more big planes for military operations in the East, and more big planes for cargo and personnel movements between the United States and South America, and presumably by way of SA to Africa.

Private sources say that the Army is considering converting some of our bomber manufacturing capacity to cargo and troop planes. But so far as can be learned, no change orders have yet been issued to the aircraft plants.

It is believed that large orders are being placed for four or five types of existing four-engined types of transports for use on this hemisphere and transatlantic. High authority, in and out of the Services, has said such a program is under way. American Machinist is reliably informed that a surprisingly large volume of cargo and men is being flown by the Army everywhere. This transportation is so satisfactory that the Army has taken half of the airlines' planes, and may take all of them.

Complete stoppage of air travel and air mail, except such as the Army would feel justified in carrying, is being considered.

Motivation behind this move toward air traffic is the serious shortage of surface shipping, and a shortage of dockage in many strategic foreign places. Some ships have been standing offshore with vital loads, waiting their

turn to come in. Quick airports (plain flat ground without the usual runways and facilities) can be built cheaper and faster than dockage.

Trip cargo of even big airplanes is small by comparison with that of ships, but the airplane's speed enables it to make scores of round trips while surface vessels make two or three a year, with aircraft piling up equivalent tonnage in the end. This proposition has long been advocated by such men as Glenn Martin, who recently startled many persons in the aircraft field with the statement he could build planes to transport goods like wheat at economical rates.

Though the transport plane program for next year and the next cannot be made public, the figures are amazingly large. The planes involved are the C-54, bigger than the DC-3; the Boeing 314 Clipper type boat; the Lockheed Constellation; the Sikorsky S-44; and the projected Douglas C-74 which will be nearly as big as the B-19 bomber—all powered with four engines.

Ship Production Line

Here is more about New Orleans Higgins Industries, which makes spoon-bottomed troop-landing boats that scoot out on dry land, and has a contract with the Maritime Commission to build 200 10,000-ton Liberty ships and expects to run them down a production line at the rate of 24 per month, or one every working day.

This production line, which has attracted national interest, turns out to be an adaptation of Higgins' system for building smaller steel combat boats. Previously it had been reported that the Liberty ships will move on trucks on rails. The fact is, they will be lifted down the mile-long production line a step at a time by cranes.

There will be four parallel assembly tracks, flanked by shops and subassembly plants. The keel will be laid upside down for convenience. At the end of the mile it will have been righted, the hull will have been developed sufficiently to float, and it will enter a canal, just wide enough to carry it between more shops and cranes.

Fifty-Year Men—The Hendey Machine Company honored old timers at a recent Foremen-Apprentice banquet. There was group singing and presentations were made to men who had been with the company fifty years

R. R. Shops to War

About 75 major and 400 smaller railways shops will be put into war materials production under an agreement between railroad management, railroad shop crafts, War Production Board, Department of Labor, and the Office of Defense Transportation. Railroad unions have agreed to work at regular base pay 48 hours a week, whereas other government contract labor works under the Walsh-Healey 40-hour week basis. For this the unions are commended by Joseph Eastman, ODT director. The Labor Department has exempted the railroad shops from the Walsh-Healey Act. The plan to utilize the railroad shops will be supervised by a Government-management-labor committee.

Copper Round-Up

If you have any supplies of copper and brass, frozen by WPB orders, you will soon be called upon sell it to the government. This will be the final step toward round-up of every possible scrap of these metals for urgent needs.

You will get a notice, quoting prices ranging from 15 cents for certain types of drawn copper wire to 30 cents for copper in other forms. Fabricated copper will be purchased at prices up to two and a half times scrap value.

Accompanying the price schedule will be a set of forms on which you will report the precise nature of the copper and copper-base alloys in your inventories, and indicate your willingness to sell. If you refuse to sell (which presumably nobody will) the government says it will requisition what it wants.

Some war producers may need copper and brass in their existing fabricated forms in which case the Copper Recovery Corporation, WPB, will simply bring buyer and seller together.

The Board recently issued a new list of more than a hundred items that must not be made of copper or its alloys after June 15. The old list was designated "A"; the new one is "A-1".

Maximum prices for non-ferrous foundry products: brass, bronze, aluminum, magesium, etc., were announced the other day by Office of Price Administration, at levels prevailing between October 1 and 15, 1941. Foundries producing about 70 percent of the nation's output had already agreed to hold prices at that level. There was no indication OPA said, that the other 30 percent was getting out of line, but the ceiling was set to "insure that the whole industry complies."

Pledge to Fighters—The Navy "E" Pennant floats over the Bell Aircraft Corporation as President Lawrence D. Bell pledges increased production "to support the men in the Service who are fighting for us"

Job Rating Urged by Timmerman at National Metal Trades Association 44th Convention

NEW YORK—The possibility of wage freezing makes job rating in industrial plants of greater importance than ever before, A. H. Timmerman, the Wagner Electric Co., retiring president of the National Metal Trades Association, said at the 44th annual convention held here at the Hotel Biltmore May 19 and 20.

Addressing the opening session of the meeting, Mr. Timmerman declared that no company could afford to be without some basis for effectively establishing standards of wage payment.

Clark Elected President

Roe S. Clark, vice president and treasurer of Package Machinery Co., was elected president of the National Metal Trades Association. Other officers elected were H. H. Kerr, Boston Gear Works, Inc., as first vice president; and George A. Seyler, Lunkenheimer Company, as second vice president and treasurer.

In a statement regarding American industry's part in the war effort, Mr. Clark said that America's 1942-43 model of industry would not only win the war for democracy, but would be the dominant factor in assuring successful postwar reconstruction.

Discussing the importance of expanding enlistment of women in war work, Dr. Donald A. Laird, psychologist of the Rivercrest Laboratory, told the meeting that he was embarrassed to find through recent research that many types of work previously thought suitable only for men are competently handled by women.

Plane production for 1942 was estimated at $9,000,000,000 by J. Carlton Ward, Jr., president, Fairchild Engine & Airplane Corporation, in an address on production in the aircraft industry. He said that 35 percent of all current United States war output is in aircraft and related products, and predicted that employment in the industry, which now exceeds 400,000, will go above a million during next year.

In a panel discussion on "How We Train for National Production," Paul E. Heckel, executive assistant, Cincinnati Bickford Tool Co., discussed the importance of executive training.

William L. Dolle, president, The Lodge & Shipley Machine Tool Co., told the panel about methods for training the many foremen that will be needed to supervise expanded industrial operations. Other speakers in the panel were K. R. Wood, factory inspector, Union Special Machine Co.; S. B. Taylor, works manager, the Reliance Electric and Engineering Co.; and William A. Ruhl, works manager, Universal Winding Co.

Kaltenborn Comments

H. V. Kaltenborn, noted news commentator, told the luncheon meeting that he advised all industry to support the unions when they are right, but to fight them when they are wrong. The Wagner Act, Supreme Court interpretations of labor matters, and War Labor Board decisions have created a new instrument of power that in some cases is being used more viciously than the power of uncontrolled trusts thirty years ago, Mr. Kaltenborn said.

Completion of America's two-ocean Navy long before the original date of 1947 was predicted by Frank Folsom, assistant chief of procurement, U. S. Navy. He said that the principal factor making this possible was the increased use of welding, which has made possible an approach to mass production methods in warship construction.

Metal Trades Association Officers, Speaker

ROE S. CLARK

H. H. KERR

WILLIAM L. DOLLE

ENLIST SAVINGS TO HELP WIN

WASHINGTON—A new and intensified program for meeting government expeditures for the war in the purchase of United States Savings Bonds and Stamps has been launched by the Secretary of the Treasury. Employers are urged to encourage their employees in every possible way in a spirit of partnership and joint loyalty among all citizens participating in the payroll savings plan. The government has issued a savings schedule for the systematic purchase of bonds based on weekly earnings from $5 to $200.

Henry Prentiss Withdraws From Machine Tool Sales

NEW YORK—Henry Prentiss & Co., Inc., will withdraw from the sales of machine tools, it was announced here by Marshall Prentiss, president. The firm will cease to accept orders on the conclusion of business May 31.

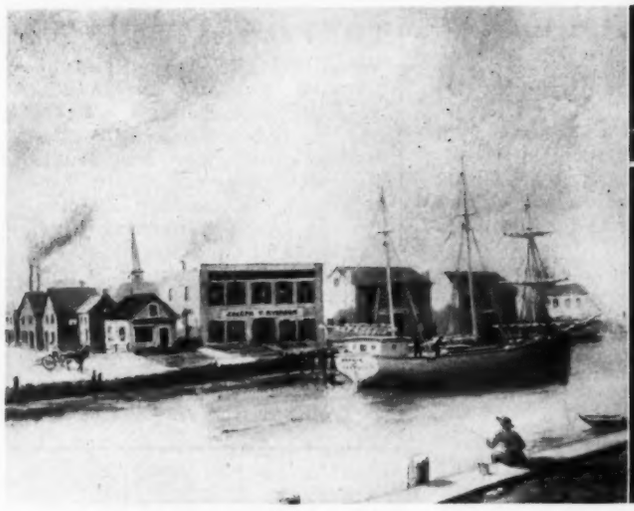
The firm was established in 1875 as H. Prentiss & Co., and pioneered in the dealer method of selling machine tools. In 1885 it was incorporated as the Prentiss Tool & Supply Company, and in August, 1916, the present designation was adopted.

Although it engaged in some manufacturing in the earlier days, the recent policy of the firm has been to limit itself to a few leading lines of metalworking machinery. At the present time it is representative for seventeen machine tool companies.

Henry Prentiss served as president of the firm until 1921, at which time he became chairman of the board. Marshall Prentiss, son of the founder, became secretary in 1908, treasurer in 1912, and has served as president and treasured since 1921. Other officers are William F. McCarthy, vice president; Leon T. Goodspeed, vice president, and Henry B. Hull, secretary.

In reviewing the history of the firm, Marshall Prentiss committed that it was interesting to note that his father was the only man still living, so far as is known, to have personally placed an advertisement in the first issue of AMERICAN MACHINIST, in November, 1877. Tribute was paid to him in 1927, upon the fiftieth anniversary of the publication.

In a letter addressed to members of the metal trades industry, Marshall Prentiss said, "Having engaged in the sale of machine tools for a long number of years, we have enjoyed many close and highly prized relationships which we sever with extreme reluctance. We are grateful for your patronage over the years and retire from the field confident that your needs will be served as heretofore."



Joseph T. Ryerson Celebrates Centennial; Started As Iron Store On Chicago River

CHICAGO—One hundred years ago Joseph T. Ryerson established the "Pittsburgh Iron Store" on the banks of the Chicago River. In the eventful years that followed, the Ryerson organization grew to a nation-wide service with ten key-city plants. Contrast between the two extremes of this century of progress are shown in the illustrations above of the original iron store and one of the modern plants. Within six months of the opening of the first store, new and larger quarters were rented. Two years from the founding, the firm leased property and erected a two-story brick warehouse in what is now Chicago's loop. The Chicago fire of 1871 brought total destruction to the Ryerson property, but immediately a new stock was ordered and business was carried on at a temporary location while a new store was being built.

The increasing tempo of the steel industry brought about the incorporation of the business in 1888 as Joseph T. Ryerson & Son, Inc. In 1914, Ryerson purchased the W. G. Hagar Iron Company of St. Louis. This first branch plant became the forerunner of a city-by-city expansion—Jersey City in 1915, Detroit in 1916, Buffalo in 1919, Cincinnati in 1923, Milwaukee in 1924, Boston in 1926, Cleveland in 1927, and Philadelphia in 1929.

Chairman of the Board today is Edward L. Ryerson, (left) grandson of the founder, and chairman of the Inland Steel Company, now its parent company.

Stove Production Order Tries Out Concentration

War Production Board this month took its first crack at concentrating a small continuing production of civilian goods into a few plants. It did it in an order restricting the production of cooking and heating stoves. Whenever WPB shuts down the production of some civilian industry—autos, radios, refrigerators—it has to decide what to do about the small but essential demand that still has to be met. Several times it has been proposed that a few plants be permitted to continue production to meet this minimum demand. In each case, however, the final decision has been to let the industry run at a high rate for a month or two, build up a stockpile, and then ration it out over the next year or so. In some cases the whole industry has been permitted to produce at a low level.

The stove order takes a different tack. After July 31 the big companies doing more than $2,000,000 a year business must stop making stoves. So must small companies which are located in designated "labor shortage areas." The other small companies are permitted to continue manufacture at a rate which will consume 70% as much steel for cookstoves and 50% as much for heating stoves as last year. Since the companies are required also to redesign to use less metal, this means they will operate at about a normal level.

The British started experimenting with concentration of industry several years ago. They took quite elaborate precautions to ensure that the profits of the continuing commercial business be divided up among the industry, to protect the brand names and post-war competitive position of the firms whose production is stopped, and the like. The stove order pays no attention to such matters. In part this is due to the accidental factor that the big units in the industry decided not to put up a fight, apparently decided they were big enough to get back into the business after the war. More importantly, it is due to the fact that we are a lot more hard-boiled nowadays about such things. Industry is used to being kicked around in the interests of the war.

Direct Outlet For Cincinnati

CINCINNATI—The Cincinnati Milling Machine Co., manufacturers of milling, broaching and cutter sharpening machines, and Cincinnati Grinders Incorporated, manufacturers of grinding and lapping machines, will on June 1st serve their customers in New York State and New England through their sales subsidiary, Cincinnati Milling and Grinding Machines, Inc., with district offices located in New York, Hartford, Boston, Buffalo and Syracuse. A staff of field engineers, service men and demonstrators, long technically trained and thoroughly experienced in milling, broaching, cutter sharpening, grinding and lapping methods, will provide effective service to the manufacturing industries in these areas.

A.M.A. Meeting Stresses Job Replacement; Care of Machines

NEW YORK—A radical adjustment of personnel policies is going to be necessary, Richard C. Brockway, Director for New York, United States Employment Service, told the American Management Association Production Conference, at Hotel Astor, May 13 and 14. Not only must 10½ million new jobs be filled, but replacements must be found for men now working who are going to be called to the armed forces. "In your position" he said, "I would bank on selective service being tough. Selective Service is going to have to be tough, to fill the ranks of the Army on schedule."

Mr. Brockway warned management that they could expect to be required to hire, at least for shortage occupations, through a single central source, which will probably be the United States Employment Service. Labor piracy and labor hoarding will be out, he said. Rationing of labor may be necessary, and job dilution—the breaking down of skilled work into a series of operations to be done by a semi-skilled crew—will certainly be employed.

Conserve Equipment

A. Hickman, Works Engineer, Factory Service Div., Westinghouse Electric & Mfg. Co., told a symposium on "Making Equipment Last" that through an inspection system and the practice of preventive maintenance to correct minor troubles, major troubles are avoided. Monthly meetings for foremen are held in each section to impress upon them the importance of conserving equipment. At this time, lectures are given by the maintenance foremen. To keep lost time at a minimum, nearly all repair work is done on the third shift, since this shift does not operate at full capacity.

H. E. Howard, production manager, Norton Company, said that since his firm used the rotating shift, repairs are made during the long break. A definite amount of time is allotted each day for a man to devote to cleaning and oiling machines. In this way, operators are encouraged to take a real interest in preventing machine breakdowns.

D. H. Samuelson, in charge of maintenance engineering, The Warner & Swasey Company, said that complete lubrication is the most important way to make equipment last. In July, 1940, Warner & Swasey had been working 24 hours a day for 20 months, and machine breakdowns were increasing at a rapid rate. At that time an oil control was set up, because it had been found that lubrication was being neglected by new employees. Under the new method, lubricants have been standardized so that fewer types are required. Lubrication charts for each make and type of machine in the plant have been prepared, and men trained to watch for all signs of trouble, take care of all lubrication. One man can handle about 100 machines, he said.

Unnecessary holding out of tools was discouraged by speeding up service at the tool crib, B. J. Keating, president, Standard Tool & Mfg. Co., told the symposium.

Steel Plate Shortage Eased Mainly By Strip Mill Output

WASHINGTON—For the second successive month steel plate shipments have met the Maritime Commission's tonnage requirements. Total for April was more than 280,000 tons.

Thus the steel plate shortage for merchant ships seems to have been appreciably eased, mainly by increased output from the strip mills. The Commission recently converted its hull program from extensive use of sheared plate to strip, which formerly went to auto plants, in thinner gage.

But ship demands were met partly by withholding steel from other war production and plant expansion. Therefore, any permanent solution of the Commission's problem will depend upon increased output of ship plate.

During recent weeks the Commission, and Admirals Land and Vickery, chairman and vice chairman, have been criticized because merchant construction was not keeping pace with the need for bottoms to carry lend-lease war goods to the Allies. But the White House took the position which many others have taken—the ship program is going nicely, and nobody is to blame because we are rolling out war goods faster than they can be hauled away. Roosevelt's statement scotched rumors that Henry J. Kaiser, west coast shipbuilder, was slated to succeed Admiral Land.

WPB and the Commission are united in efforts to get the right plate to the right place at the right time. Plate and all other parts and materials are purchased and distributed by the Commission to the various yards, under an "assembly line" system.

REVERE FLIES NAVY "E" FLAG

ROME, N. Y.—Award of the Navy "E" flag for excellence in production was made to Revere Copper and Brass Incorporated, Rome Division by Admiral H. A. Wiley in an impressive ceremony. Last month a flag was presented to the New Bedford Division.

The flag was accepted by C. Donald Dallas, president of the company, and F. E. Richmond, works manager read the pledge to victory to 3,000 workers and their families assembled in Riverdale Park. Others taking part in the ceremony were L. A. Wiggins, vice-president of Revere Copper and Brass, who welcomed Admiral Wiley; Mayor Walter W. Abbott; Congressman Fred J. Douglas; Capt. J. S. Evans, U.S.N. inspector of naval material; Walter T. Brown, secretary to Gov. Lehman.

Ingenuity Saves Days—Such rapid progress was made in constructing this army cargo ship C-46, that it was ready for removal from the splicing fixture long before the new overhead crane was scheduled to be installed. The local Cleveland Tramrail representative and Curtiss engineers improvised this crane from sundry parts on hand, so that the plane—which will have a carrying capacity of 50,000 pounds—could be moved on schedule

U.S. Plate Output Double Rest of World, Steel Institute Told

NEW YORK—The steel industry is now making nearly twice the tonnage of plate that all the rest of the world can roll, Walter S. Tower, president, American Iron and Steel Institute, told the organization's 51st general meeting at the Waldorf-Astoria here May 21.

He reviewed the development of the steel industry during the past year, emphasizing the shift from consumer use to war production. The industry established a new record of production, he said, with an output of ingots close to 84,000,000 tons. Electric furnace production rose to more than three times the output for any year prior to 1940. For four successive quarters the rate of operations remained above 95 percent. It has now been above 90 percent for more than 21 months, the longest sustained effort in the record of steel making, Mr. Tower said.

During the period of 18 or 20 months from the autumn of 1939, large quantities of steel not required for defense purposes went into a variety of items like automobiles, refrigerators, radios, washing machines, and others. In that way a store of consumer durable goods was built up, either in the hands of makers or in the hands of purchasers. It seems likely, therefore, that a civilian supply, even smaller than that consumed at the depths of the depression, might suffice, at least for some time, according to Mr. Tower.

C. E. Adams, chief, Iron and Steel Branch, War Production Board, addressed the meeting at its general session. Technical sessions took the form of round table discussions on the subjects of blast furnace and coke oven operations, steelmaking practices, conservation of critical alloying elements, and steelmaking raw materials. The banquet was omitted from the program this year because of the war.

Biggest Volume — Walter Harnischfeger, president of the Harnischfeger Corporation, points to poster that helped the company turn out the biggest volume in its history. Rear Admiral Cluverius, USN, is extending congratulations to the firm for winning the Navy "E"

Regional Offices Set Up In Thirteen Cities by WPB

WASHINGTON—The most important step yet taken in decentralization of the board activities throughout the nation is the setting up of thirteen regional offices and vesting broad authority in the regional directors. The work of the War Production Board in Washington will center in policy determination, program planning, the institution of major procedures and general coordination while the day-to-day operations will be conducted through the regional offices.

All existing field offices of the WPB will be discontinued as independent units and will become a part of the regional offices set up. Region No. 1 will be located in Boston, and consecutively numbered they are to be established in New York, Philadelphia, Atlanta, Cleveland, Chicago, Kansas City, Dallas, Denver, San Francisco, Detroit, Minneapolis and Seattle. So far six directors have been named, as follows, Orville H. Bullitt in Philadelphia, Ernest Kanzler in Detroit, Frank H. Neely in Atlanta, John C. Virden in Cleveland, Joseph L. Overlock in Chicago and Walter H. Wheeler in Boston.

Pendray, Boyd Honored

G. Edward Pendray, assistant to the president in charge of publicity and advertising, Westinghouse Electric & Mfg. Co.; and James Boyd, eastern district manager, have been awarded the Westinghouse Order of Merit. Each received a bronze medal and certificate. Mr. Pendray was cited "for his profound understanding of the mind of the public in its relation to a large industrial organization; for his sound and effective administration of publicity and advertising, and for his ability to combine individual initiative with cooperation within the company." Mr. Boyd's citation was "for his clear-sighted, practical sales ability in serving a complicated metropolitan area; for his management of a sales organization under difficult conditions existing in that area; and for his personal salesmanship and courage in handling large and difficult negotiations."

No Time For Comedy—Production is serious business on this Bench Aircraft Company assembly floor. The planes seen in seemingly endless lines are advanced trainers for the Army Air Corps—just one of the types turned out in this plant

NAMES in the NEWS

A. F. Allen is retiring as secretary-treasurer of the American Steel & Wire Co. His association with the company dates back to the year of its formation and he has been over 52 years with subsidiary companies of the United States Steel Corp.

Joseph L. Auer has been appointed vice-president in charge of production of R. Hoe & Co., Inc. He has been general works manager since he joined the organization in 1937. Mr. Auer has been active in the anti-aircraft defense program and is chairman of the Anti-Aircraft Carriage Committee of the Army Ordnance.

Thomas A. Baggs has been made chief of the Truck Section of the Auto-

motive Branch of the War Production Board. For the past 16 months he has been an industrial specialist with the Office of Production Management and War Production Board.

Charles Neal Barney, who has been connected with the Worthington Pump & Machinery Corp. since 1918 and treasurer since 1931, has been appointed a vice-president.

John P. Bernard, vice-president and assistant general manager of the Sheffield Corp., Dayton, O., has been made a director of the company.

Harkness W. Cram has been appointed vice-president in charge of sales of the Aircraft Screw Products Co., Inc., Long Island City, N. Y. He was formerly sales manager of the company.

Bern Dibner, vice-president and general manager of Burndy Engineering Co., New York, N. Y., has joined the U. S. Air Corps with the rank of Captain. To fill the vacancy during his absence Marvin Lee, chief engineer, has been named acting general manager.

R. S. Elberty, Jr. has been appointed experimental engineer of T. W. & C. B. Sheridan Co. located at the main office in New York City.

Walter Geist has been elected president of Allis-Chalmers Mfg. Co., Milwaukee, to succeed W. C. Buchanan who resigned because of ill health. Mr. Geist began his career with the company as errand boy in 1909 and advanced rapidly to a tracer, draftsman, designer,

and was made engineer-in-charge of transmission at the age of 31 years. After two years of experimentation he developed the widely known Texrope V-belt drive for the textile industry and then seeing the possibilities it offered in other industries pushed ahead further applications of the drive. In 1933 Mr. Geist was made general representative of the company in charge of personnel of all the district offices, foreign and domestic, all dealers, sales promotion and advertising. After six years he became a vice-president, and just prior to his present appointment was executive vice-president. In 1940 he was awarded the "Plaque of a Modern Pioneer" for his research and original work in the power transmission field.

Vice President, Sheffield Director and Secretary

JOSEPH AUER

JOHN BERNARD

EDWARD NOE

Charles Owens Guernsey, vice-president of the J. G. Brill Co., Philadelphia, has been granted a leave of absence by the company to accept a position as technical advisor to Col. D. N. Hauseman of the Philadelphia Ordnance District.

A. I. Henderson has become director of materials of the War Production Board succeeding William L. Batt. He has been closely associated with Mr. Batt in the materials field since the creation of the National Defense Advisory Commission in 1940.

George A. Higgins has been appointed manager of sales, Bar, Strip and Semi-Finished Materials Div., Carnegie-Illinois Steel Corp., Pittsburgh.

P. N. Jansen, formerly general factory manager of the Airplane Div. of Curtiss-Wright Corp., has been appointed director of manufacturing. John Lee, J. P. Davey and W. A. Schanne have been made assistant directors.

Hugh H. Johnson, for the past nine years in charge of advertising for the Buick Motor Div. of General Motors Corp., has been named advertising manager of Bell Aircraft Corp. of Buffalo.

McClure Kelly, formerly vice-president and treasurer of Western-Austin Co., Aurora, Ill., has been appointed president of the company.

E. M. Kropp and Peter Robertson have been made assistant chief industrial engineers of Republic Steel Corp. Mr. Kropp will handle management studies and general industrial engineering problems while Mr. Robertson will continue on manufacturing problems and plant layouts.

Allan S. Lehman has been elected a director of the Studebaker Corp. He is also vice-president and a director of Lehman Corp.

Edward Noe has been announced as secretary of the Sheffield Corp. For many years he has handled the company's patent problems and in his new position Mr. Noe continues that importan activity.

Joseph G. Schaefer has been appointed vice-president in charge of operations of Wyckoff Drawn Steel Co. at Ambridge and Chicago.

Arthur H. Schauer has accepted a position on the sales and service force of the George Keller Machinery Co., Buffalo, having severed his connection with the Westinghouse Electric & Mfg. Co. of that city.

Ira A. Terry has been named general assistant to H. A. Winne, vice-president in charge of design engineering, Apparatus Dept., General Electric Co. Walter C. Heckman of the Turbine Engineering Dept. has succeeded Mr. Terry in the works manager's office as assistant to J. D. Harnden.

Louis R. Wallack has been appointed in charge of industrial relations for Clarke-Harrison, Inc., Philadelphia.

William D. West and Edwin M. Tait have been added as sales representatives of Magnus Chemical Co. with headquarters in Greenville, S. C. and Minneapolis, Minn. respectively.

Walter H. Wheeler, Jr., has been appointed New England regional director of the War Production Board. His

Thumbs Up — The $4,000 contributed to Cleveland's "Bomber for MacArthur" Fund by employes of the Lincoln Electric Company was personally matched by James F. Lincoln, president. Standing around a new Lincoln Welder are (left to right) Edward F. Thomas, Duncan White, Miss Grace Roth, Lincoln, Edward M. Miller, and Don Miller

headquarters are in Boston and he will be responsible for the administration of all WPB field offices in the six New England states.

Gerald Z. Wollman has been announced works manager of the Westinghouse Electric & Mfg. Co. plant at Sunbury, Pa. The plant is being converted to manufacture heavy types of communication equipment.

Robert M. Zacharias has become associated with the McKenna Metals Co., Latrobe, Pa. to assist in the company's expansion program.

OBITUARIES

George A. Decker, 77, a director of the Warner & Swasey Co. and works manager for 25 years before his retirement in 1940 died recently. He become an apprentice for the company in 1882, but before finishing his apprenticeship he

was appointed foreman of the lathe department because of his aptitude. He later became assistant superintendent of the company and then superintendent. Mr. Decker was considered a specialist on the installation of revolving domes.

Allison Sharp, vice-president and treasurer of the Wicaco Machine Corp., Philadelphia, died recently.

Edward A. Sohn, 73, president of the Bedford Foundry and Machine Co., Bedford, Ind. passed away recently.

Cary D. Water, president of C. J. Tagliabue Mfg. Co. has passed away.

BUSINESS ITEMS

John F. Diehl, eastern sales representative of the Detroit Stamping Co., has opened a warehouse in New York City at 210 E. 34th St. to carry a substantial stock of all types and sizes of De-Sta-Co toggle clamps.

Giebel Machine Tool Co., 250 W. 57th St. New York City, has been appointed exclusive agents in the New York and Connecticut area for the complete line of the Hanchett Mfg. Co. of Big Rapids, Mich.

Magnus Chemical Co., Garwood, N. J. has announced the organization of a Machine Division for the manufacture of mechanical metal washing machines, pickling machines, driers, ovens and burnishing equipment under the direction of Marcel Zinty.

Osborn Mfg. Co., Cleveland, has announced six appointments in the brush engineering field service force of specially trained power-brushing technicians. Page A. Mead will be located in Delmar, N. Y. and will serve war plants in the eastern portion of New York state; Paul A. Malling will cover New Jersey being located in Fairlawn; William F. Short, located in Hamburg, N. Y. will serve Buffalo and western New York; Max Sherwood will work out of the company's Chicago office; Gilbert B. Pecsok out of the New York City office; and Ralph B. Jones will have headquarters at the Cleveland office.

Wheelco Instruments Co. has named four new district representatives. Pasol Engineering Co. will be Iowa and Nebraska representative with V. E. Lindquist in charge of the office at Des Moines, and I. I. Solzman heading the Nebraska office in Omaha. Fitzgerald, Inc., Wichita has been assigned the Kansas territory, with Bloyce Fitzgerald in charge. Charles A. Drum, Houston, has been named Texas district manager.

PLANT EXPANSION

Aluminum Company of America is erecting additions to three of its buildings at the Los Angeles plant costing a total of $828,000.

American Bridge Co., U. S. Steel subsidiary, has announced that it will operate under lease from the Navy Department a fabricating plant for the construction of hulls to be erected at an estimated cost of $8,500,000.

Carnegie-Illinois Steel Corp. is expanding facilities for tank armor production which will enable the corporation to more than triple its present output of principal tank hull parts.

Douglas Aircraft Co. has planned to erect windowless structures in the Los Angeles area at the cost of approximately $4,000,000.

International Machine Tool Corp. is building plant additions at the Foster Division costing several thousand dollars.

Earle M. Jorgensen Co. will erect a new forge press plant in Los Angeles costing about $250,000.

E. B. Knickerbocker Machinery Co., Indianapolis, has leased a building to provide additional facilities to meet demands for heavy machine tools and equipment.

U. S. Spring & Bumper Co., Vernon, Calif., has announced that an addition will be made to the plant to cost $30,000.

MEETINGS

American Management Association. General management conference. Pennsylvania Hotel, New York, N. Y. June 5.

American Society for Testing Materials. Annual meeting. Chalfonte-Haddon Hall, Atlantic City, N. J., June 22-26.

Society of Automotive Engineers. Annual summer meeting. The Greenbrier, White Sulphur Springs, W. Va. May 31-June 5.

SHOP EQUIPMENT NEWS

Timken Builds Single-Spindle Automatic Which Handles Parts 10 Inches In Diameter

Outer races for tapered roller bearings, usually referred to as cups, are produced from tubing up to 10½ in. diameter on a single spindle automatic, built by the Timken Roller Bearing Co., Canton, Ohio. The tube is chucked in a master collet having pads that correspond to the tube size. The rough and finish turning tools, as well as the chamfering tool, are spaced at different points around the cup so as to clear each other. The main slide has, at its forward end, a cross slide in which the bar holding the rough and finish boring tools is mounted. This cross slide engages a taper attachment during the feed motion, for producing the tapered bore. At the end of the forward motion of the main slide, the tools are retracted automatically so as not to mark the finished bore during their return. The main slide carries three more tools, one each for the rough turning, finish turning and chamfering tool.

The radius tools and the facing tool are mounted on a tool arm in front of the machine and are fed radially. The cut-off tool is mounted on a rear tool arm and also is fed radially. With this tooling arrangement only one operation is needed, instead of the usual two operations required when making a cut of this kind on a standard single-spindle automatic. Thus the time normally required for retracting the turret slide, indexing the turret and reapproaching the work piece is saved. Although but two turret positions were actually used, the turret had to be indexed through all its stations for each piece made, increasing the time lost.

Outside of substituting a plain tool slide for the turret slide, a number of other departures from conventional screw machine design were incorporated in the machine. Each of the two swinging side tool arms is mounted on a long tube, having one bearing in the front of the head stock, directly behind the tool arm, and another bearing in front of the tail stock casting. These two tubes are of large diameter and form the guide ways for the main tool slide. The result is that the side tool arms have an unusually rigid mounting, due to the long spread of their pivot points, and that fewer parts are needed, since the guide tubes serve the double purpose of supporting the side tool arms and forming the ways for the main tool slide.

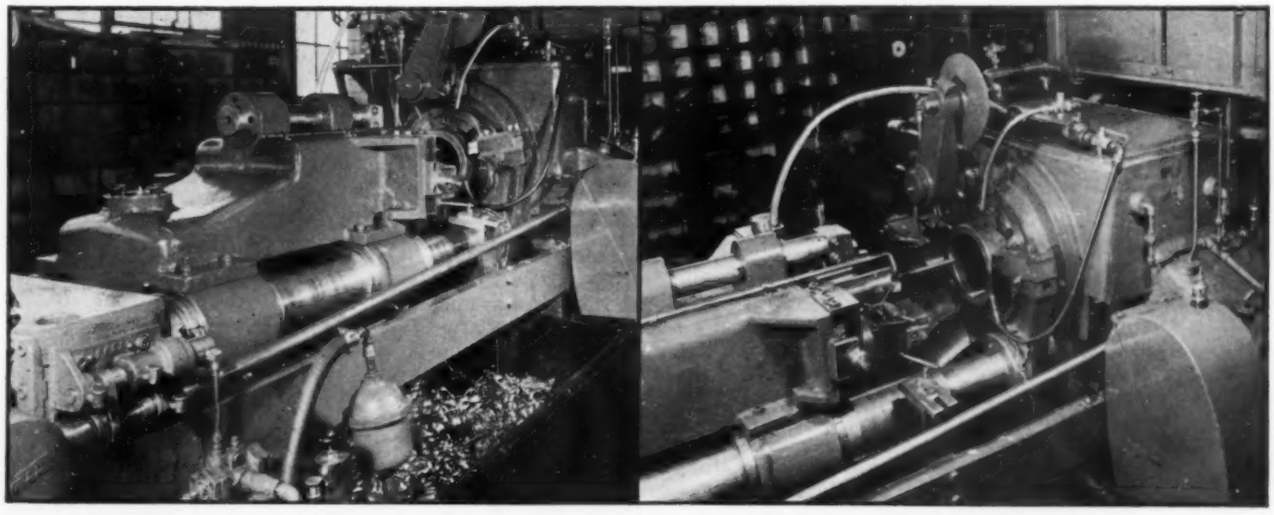
Another departure from the design of single spindle automatics is the elimination of the automatic bar feed and substitution of a manually operated ratchet type bar feed. The duration of the cycle is from 8 to 12 min., depending on the size of the work, so that the fact that an extra 30 sec. are needed for feeding up the tube and rechucking it, is of small importance and is offset by the advantage of simpler design of the manual feed.

The two side tool arms receive their motion from a double-sided face cam. The cam for the main slide rides on the guide tubes on four bearings with adjustable split bronze bushings. The front ends of the two forward bushings are well protected against chips by leather seals. The front bearings of the guide tubes also are provided with a leather seal and an additional labyrinth seal each. Therefore, none of the bearing surfaces for either side tool arms or main slide are exposed to chips. Shields are used to protect the ways of the cross slide in front of the main slide, although these ways are far enough removed from the tool points that they are not exposed to chips.

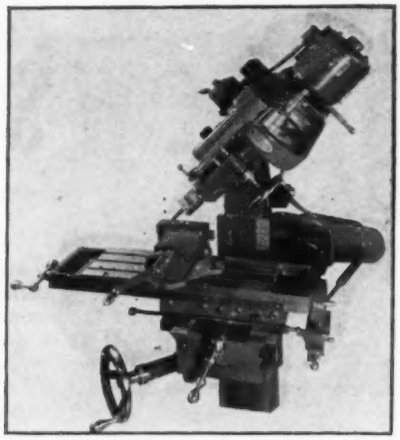
A number of these machines are to be built and they are believed to be larger in bar or tube size capacity than any automatic bar feed machine made. They are expected to show the feasibility of making ring-shaped parts of 10 in. diameter and over from tubing.

Blank & Buxton Index Mill Handles End Mills, Jig Boring

A drive to produce speeds fast enough to use small end mills and at the same time slow enough to do ordinary jig boring has been incorporated in the index mill built by the Blank & Buxton Machinery Co., 3106 E. Michigan Ave., Jackson, Mich. In conjunction with the drive, verniers have been added to the table, cross and longitudinal, for



This single-spindle automatic built by the Timken Roller Bearing Co. is believed to be the largest ever built. It produces the outer races for bearings in one operation instead of the two previously required



precision locating and power feed to the quill movement of the spindle, making it possible to produce smooth and perfect holes.

The spindle has a No. 9 Brown & Sharpe taper and six hard chrome-plated splines driven by broached and hardened driver mounted on ball bearings at the top of the spindle housing thus relieving belt strain. Preloaded ball bearings which run the spindle are packed in special grease.

Porter-Cable Metal Shaper Driven By 'Any Speed' Control

The "Seven Inch" metal shaper, introduced by the Porter-Cable Machine Company, Syracuse, N. Y., is a self-contained, motor-driven unit with motor and speed change control mounted in the floor pedestal. The length of ram travel is 7⅜ in. and, driven through "Any speed" control, operates at any speed from 64 to 175 strokes per minute. A 4-in. diameter tool head swivels 360 deg. and travels 2⅜ in. The ram is 16⅛ in. long by 5 in. wide. An 8×8×7½-in. table has a traverse of 10½ in. and vertical travel of 5½ in. Table is adjusted by means of a con-

veniently located hand wheel. Sprocket and chain drive insures smoother operation, and an extra heavy crank pin plate keeps chatter to a minimum. Six cross feeds are obtainable from 0.002 to 0.012. Tapered pins for quickly locating head and vise, and micro set ram for quick set-up are some of the outstanding features. Equipped with standard ½ hp. motor, and pedestal, the weight is approximately 485 lb., floor space required 14 in. long by 19 in. It is approximately 51 in. high over all.

Weltronic Capacitor Welder Has Eight Charging Rates

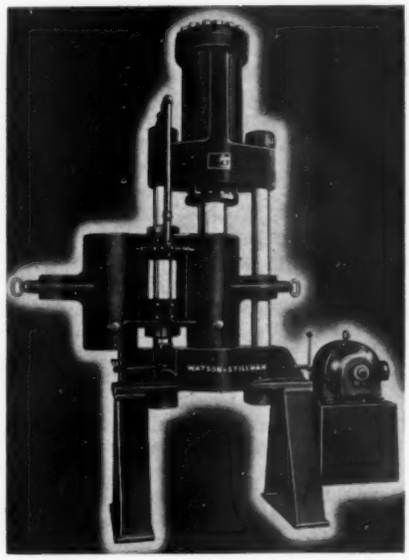
Many new features have been incorporated in the new "Revers-O-Charge" capacitor weld unit announced by Weltronic Corp., 3051 E. Outer Drive, Detroit, Mich. A voltage regulator dial near the center of the deadfront panel permits controlling the charge of condensers to desired voltage. The exact number of condensers to be charged can be selected readily by means of

two five-point tap switches on the panel. An eight-point switch at the bottom of the panel permits selection of any one of eight different charging rates to suit the characteristics of the operation.

Among the advantages of this unit are the elimination of all moving elements between the condensers and welding transformers, partial recharging of condenser by the collapse of the field of the transformer after each weld which enables a material reduction in line and rectifier loads and quick heating tubes. An important safety feature of the "Revers-O-Charge" is the automatic discharge of the capacitor banks by means of a contactor with a shorting bar when the power is shut off. The cabinet occupies a floor space of 28x58 in. with height of 72 in. The unit is designed for operation on 230-460 volts 3-phase and is available for either 50 or 60 cycle.

Watson-Stillman Press Has Two Straining Cylinders

Fluids are strained or filtered under a pressure of 2,000 lb. per sq.in. in a 200-ton capacity hydraulic straining press manufactured by the Watson-Stillman Co., Roselle, N. J. The ma-

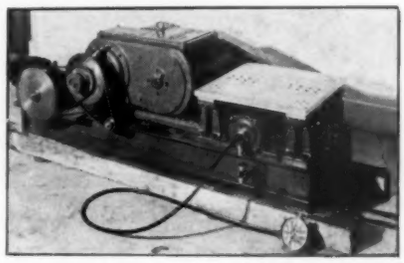


chine has two cylindrical containers, each 10 in. in diameter and 33 in. deep, mounted on a swinging arm so that one may be filled while the press strains material from the other.

The press is self-contained, including 20 hp. motor, 18 g.p.m. pump, and oil tank. The unit weighs 15,000 lb., is 14 ft. high and requires 5×3 ft. of floor space. The main ram has a 33-in. stroke and operates in a double-acting cylinder.

Johnson Vibrator Testing Unit Has Reeves Vari-Speed Drive

Used for testing the ability of any product to withstand vibration a variable speed vibrator manufactured by Walter A. Johnson, Associates, 423 Oak Ave., Ithaca, N. Y., is equipped with a Reeves variable speed motor-drive by which the frequency of vibration may be adjusted, accurately, up to 6,000 cycles per minute. At present the most



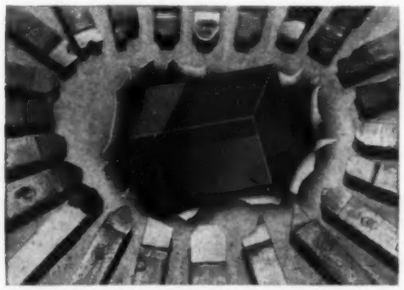
USE THIS METHOD TO GRIND CARBOLOY TOOLS QUICKLY—EASILY—EFFICIENTLY

Correct grinding of Carboloy tools is important! A poor grind wastes carbides, delays vital production and increases costs. A good grind provides long, trouble-free life between tool changes, conserves tools and speeds production.

When established procedure is followed, Carboloy tools can be ground quickly, efficiently and just as easily as ordinary tools. Below are a few of the more important points to observe. Detailed instructions are available upon request. These are contained in a 32-page manual on Carboloy tool design, application, brazing and maintenance.

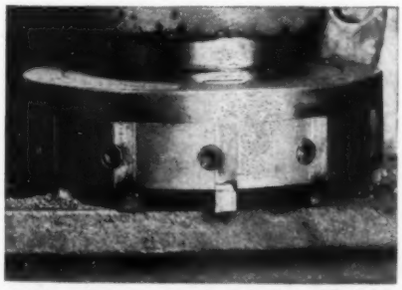
Use Standard Tools for Economy, Flexibility and Prompt Delivery

Carboloy Standard-Stock tools are available in 10 styles, a wide range of sizes and in general purpose grades for steel, cast iron, non-ferrous metals and non-metallics. They are adaptable to 80% of all turning, facing and boring jobs.



One user makes 200 "Specials" from one style of Standard

Many users maintain a stock of these standards in their tool crib and quickly grind to special shapes as required, ready for the job usually in less than one hour. One user (see cut) quickly adapts 200 special shapes from one style of Carboloy standard tool. Another (see cut) uses these standard tools as blades in face mills.



Another plant uses Standard Tools as blades in face mill

For a short cut to speed up—use Carboloy Standard Tools. Catalog GT-140.

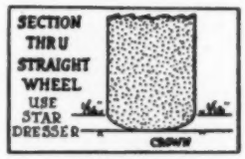
1. Use Correct Grinding Wheels

Use only the soft silicon carbide wheels recommended by wheel manufacturers or your carbide tool supplier. The following wheels are recommended for grinding single-point straight shank Carboloy tools:

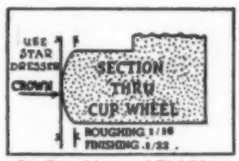
	Wheel Specifications	
	Carborundum	Norton
ROUGHING		
Silicon Carbide Wheels (Not recommended in sizes less than 10" dia.)	G-60-R-W	3960/1 I 7
Diamond Wheels (For Carboloy Tip)	100	100
FINISHING		
Silicon Carbide Wheels (Cup)	G-100-S-W	39100/1 H+7
LAPPING		
Diamond Wheels	240 Grit	220 Grit

2. Dress Wheels for Rapid Stock Removal

Correct dressing of wheels is important in safely obtaining rapid stock removal. Method shown enables you to keep area of contact against tool at a MINIMUM—avoiding generation of excessive localized heat—an absolute essential when grinding safely and rapidly.



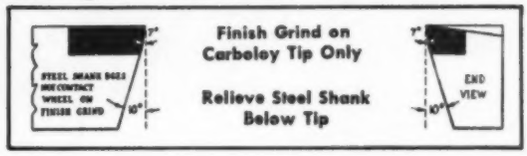
For Roughing



For Roughing and Finishing

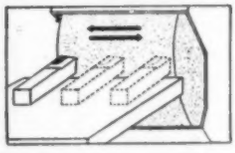
3. Use Double Angles to Insure Good Finish

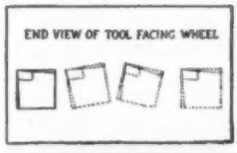
When rough grinding, ALWAYS grind side and front relief angles 2° to 5° greater than finished angle desired. By this you avoid grinding on the steel shank when finish grinding. Steel loads wheel rapidly—prevents you from obtaining best possible cutting edge. (Use regular abrasive wheel for grinding steel.)



4. Important! Keep Tool Constantly Moving

The following movements prevent excessive localized heating in the Carboloy tip and assure uniform wheel wear: Keep tool moving back and forth across wheel at all times while roughing, finish grinding and lapping. Keep tool ROCKING during roughing and finishing, as shown.





General Hints

If top face needs grinding, always grind it first. Then grind: (1) Front relief; (2) side relief; (3) radius. Complete each cycle for roughing, finishing, lapping.

Use rigid, carbide tool grinders equipped with adjustable table rests and graduated dial to obtain correct angles.

CARBOLOY COMPANY, INC.

11149 E. 8 MILE AVE., DETROIT, MICH.

Chicago • Cleveland • Los Angeles • Newark • Philadelphia
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Canadian Distributor: Canadian General Electric Co., Ltd., Toronto, Canada

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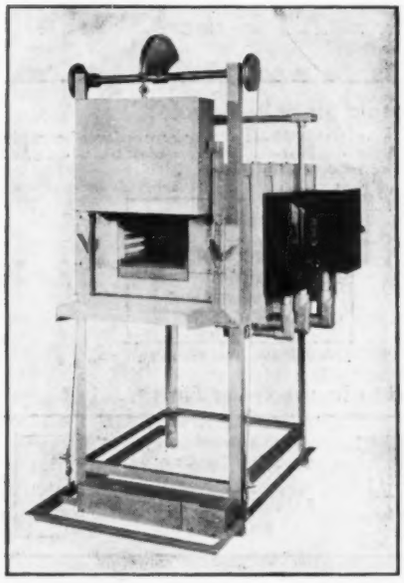
FOR THE MANUFACTURING • MINING • TRANSPORTATION • CONSTRUCTION INDUSTRIES

important uses for this machine are for testing aircraft and tank radio, radio accessories, instruments, dynamoters, controls and other devices for wartime service. The motion of the table is simple harmonic, in one plane, and the amplitude is adjustable from 0 in. to .0625 in. Size of table is 18×18½ in. and the capacity is 100 lb. at 32 g, more as frequency limit is reduced.

Falcon Electric Furnaces Have Automatic Temperature Control

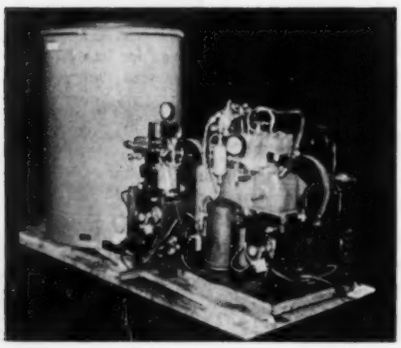
Electric box type and muffle type furnaces, intended for factory and laboratory use, are announced by H. O. Swobodo, Inc., Thirteenth St., New Brighton, Pa. These "Falcon" furnaces are arranged for either floor or bench



mounting, and are equipped with heavy alloy heating elements for operation at temperatures up to 2,300 F. Automatic temperature controls are mounted on the side of the furnace, completely wired for connecting to power supply. The furnace is equipped with a foot-treadle operated door mechanism.

Deepfreeze Industrial Unit Facilitates Shrink Fits

A Deepfreeze unit with temperature control adjustment from —60 F. to —120 F., and intended for industrial



uses, is produced by the Motor Products Corp., Deepfreeze Div., Detroit, Mich. The unit can be used to facilitate shrink fits in assembly operation, for shrinking bushing and bearing inserts, and for the storage of annealed aluminum alloy parts.

Weight of the unit is 800 lb. Outside dimensions are height, 37 in.; length, 63 in.; width, 26½ in. Cold cylinder is 24 in. diameter × 30 in. deep.

Oversize Filter Increases Uses of Dustkop Collector

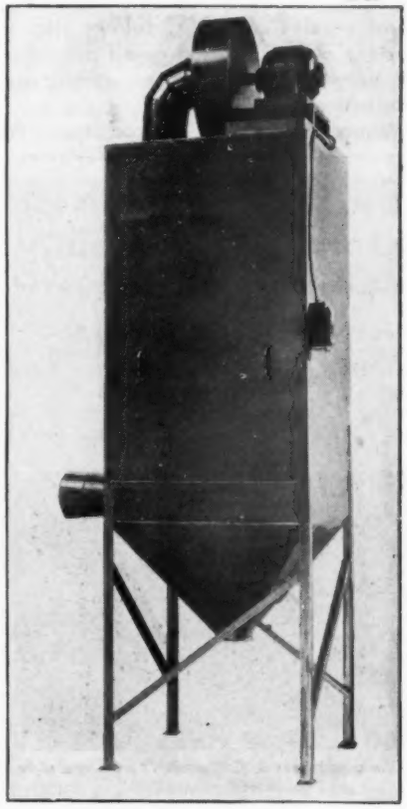
A cylindrical type filter designed oversize to increase the range of uses of the standard Model 600 Dustkop self-contained dust collector is announced by the Aget-Detroit Mfg. Co., Book Tower, Detroit, Mich. With this filter, the dust collector can be employed to collect dust from the largest sizes of tool, surface and similar production grinding operations.

The filter is available as a complete unit so that when the flat filter and louvered cover already in use are discarded, the new assembly is fitted on without the use of tools. Having over five times the area of the standard flat filter, the new style reduces back pressure, but does not increase floor

space required. Faster and easier removal of the dust collecting pan, proportionately longer filter life compared with the flat filter, and an increase of approximately 1,500 ft. per min. air speed velocity without change in fan or motor are among the advantages claimed for the new filter.

Leiman Dust Collector Fits Individual or Group Machines

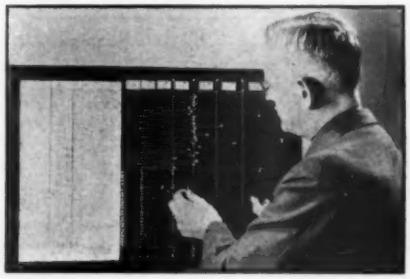
Leiman Bros., 114-9 Christie St., Newark, N. J., offers a dust collector which has from 12 to 66 bags of specially woven cloth designed to separate the dust from the air. The bags may be cleaned by means of hand or motor-driven shakers. The lower compartment of the collector holds the dust dropping off the bags and the heavier parts which are trapped there due to the slower action of the air. A remov-



able panel in the cabinet makes it possible to clean the compartment or replace the cloth strainer bags with ease. The collector may be attached to individual or group machines and used with or without outside-of-the-building exhaust.

'Produc-Trol' Control System Checks Materials and Labor

Announcement has been made by the Wassell Organization, Westport, Conn., of "Produc-Trol" system for keeping check on materials and labor. The device enables the production man to see quickly all facts concerning machine and man hours, raw materials, parts and assemblies. Movable tapes working from left to right on pulleys bring all pertinent facts into instant focus. Double rows of peg holes under



THE NEW DETROIT

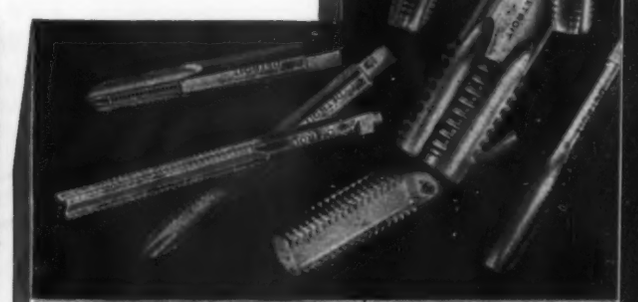
Tap Reconditioner

1. CHAMFERS R. & L. H. TAPS
2. SPIRAL POINTS
3. POLISHES SPIRAL POINTS

The new Detroit Tap Reconditioner has been developed to meet the need for conservation of tools under the War Production Program by decreasing tap consumption, decreasing tapping costs through increasing the output per tap during its useful life and providing an efficient low-cost method of accurately reconditioning taps.

Bulletin TR-1, describing the Detroit Tap Reconditioner is available on request.

Write for your handy Wall Chart—"Recommended Angles for Reconditioning Taps".



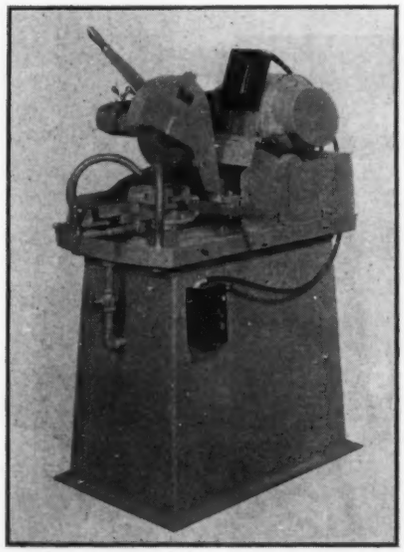
DETROIT TAP & TOOL Company 8432 BUTLER DETROIT

the movable tapes and various colored pegs permit many arrangements of comparative data and control required for an operation.

The unit is available in sizes to fit specific needs and in models for individual and group incentive plans.

Radiac Abrasive Cut-Off Machine Uses Wet Method

Bars, tubing and formed shapes are handled in the Radiac Type N Abrasive Wet Cut-Off Machine, built by A. P. de Sanno & Son, Inc., Phoenixville, Pa. The cut is clean and smooth, and seldom requires any additional finishing. The coolant increases wheel life, reduces cutting heat, and minimizes any

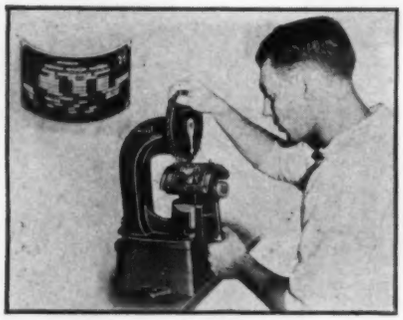


tendency to burn. The machine is balanced to eliminate vibration. Two types of vises may be supplied. A straight vise for straight cuts only, or a swivel vise for straight or angle cuts up to 45 deg.

Unskilled Help Can Operate Acromark Numbering Machine

The No. 4 Acromarker lettering and numbering machine developed by the Acromark Corp., 9-13 Morrell St., Elizabeth, N. J., enables unskilled help to accurately stamp detail information quickly.

In operation the curved plate is lifted against the marking dial which

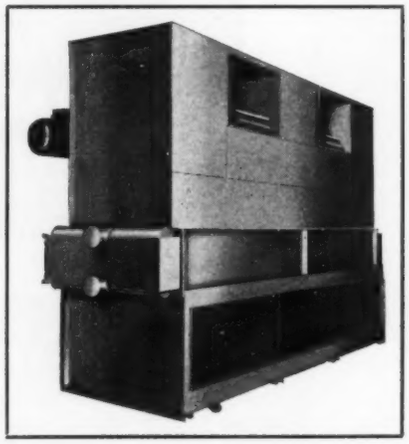


is swung to stamp the desired character, figure or letter. The name plate is advanced for character spacing by swinging against a ratchet control, and an adjustment screw at the front moves the name plate forward or backward for line spacing. Prominent characters on the face of the marking dial permit quick selection of desired letters or figures, and the character being stamped is indicated by a pointer.

The machine can be furnished ready for attachment to work bench, or a cast iron pedestal is available if desired, and are made to order to suit size and curvature of plates.

Trane Quenching Oil Cooler Can be Mounted on Ceiling

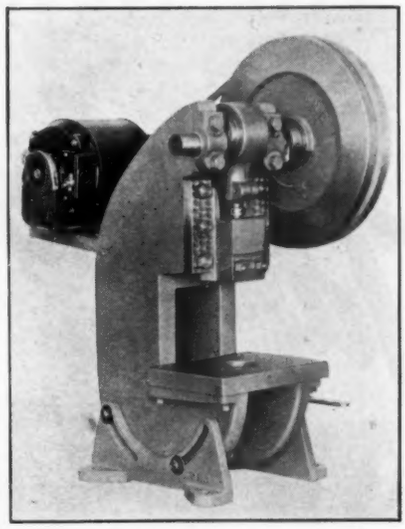
A quenching oil cooler for industrial applications calling for the quenching process of hardening steel is produced by the Trane Co., La Crosse, Wis. The cooler is a self-contained unit, and can be placed inside the area or space in which the cooling operation takes place. It can be suspended from the truss structure of the building if desired. This method of oil cooling lends itself readily to automatic control and is simple to protect against freezing. A pump circulates oil from the quench-



ing tank through the cooler and back to the quenching tank. Any desired temperature not lower than 100 F. can be maintained automatically. Features include a rigid angle iron framework with heavy gage side sheets; a light weight, high-heat transfer, cleanable type oil cooling coil; ample size squirrel cage fans mounted on a heavy ground and polished steel shaft; and a heavy gage steel spray water tank and angle supports.

Duro Punch Presses Have Bronze Bearings at Wear Points

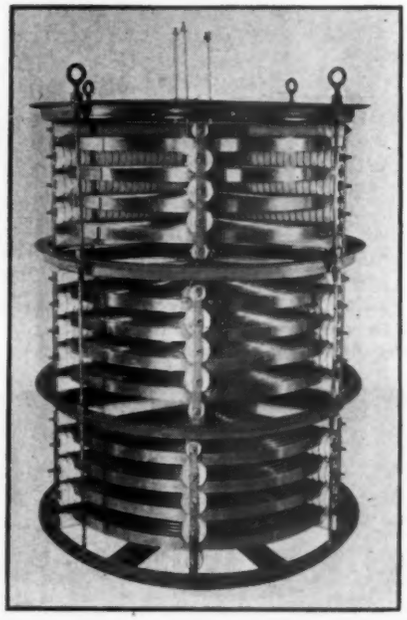
Bronze bearings at all wear points are included in a line of punch presses offered by the Duro Mfg. Co., 800 E. 61st St., Los Angeles, Calif. The presses are available in one-ton and four-ton models. The driving shaft is of heat-treated alloy steel, without ec-

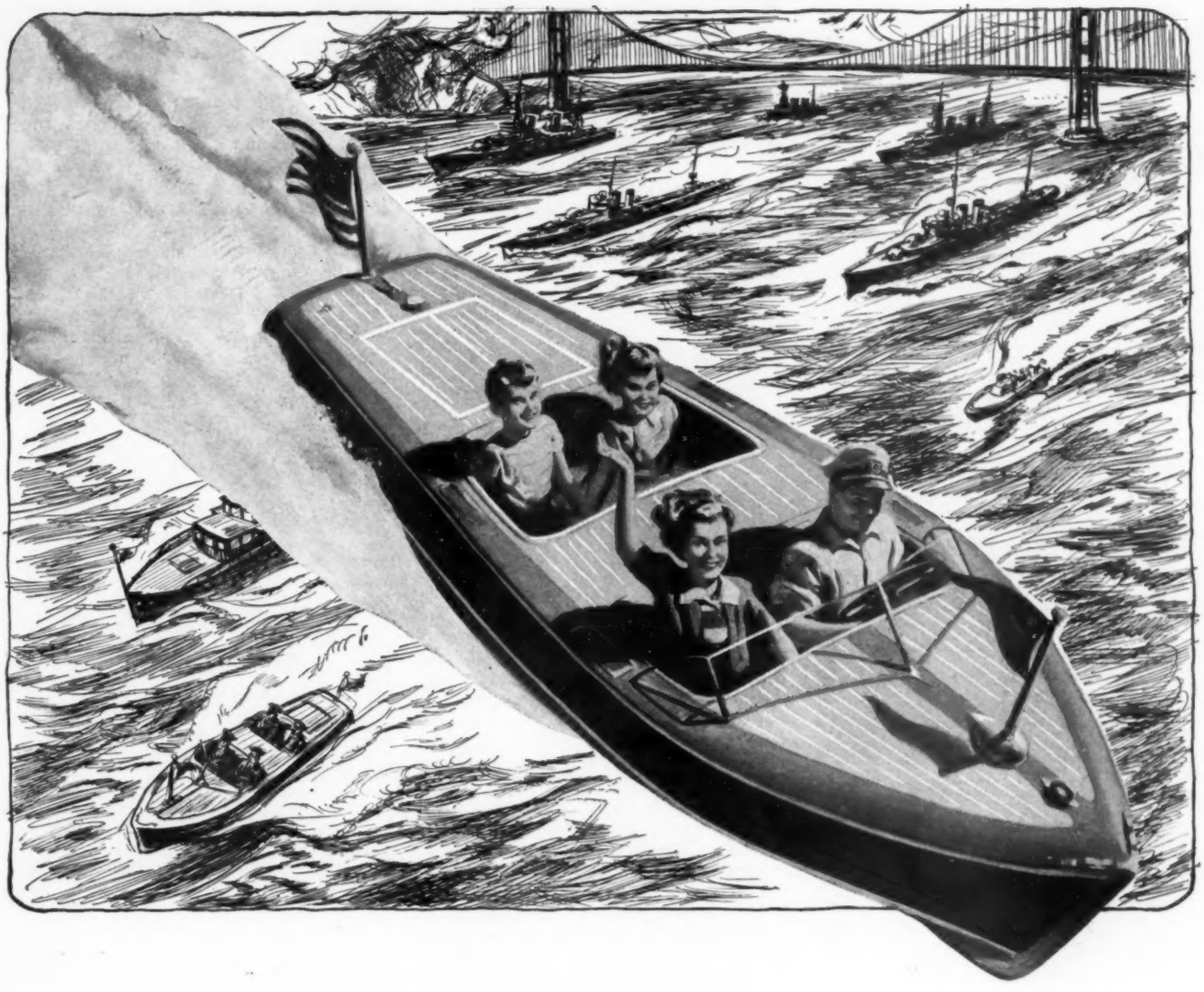


centric, eliminating danger of shearing or twisting. Directional change or punch force is transmitted by an eccentric press fit onto the driving shaft. The ram rides in semi-steel guides slotted for lubricant distribution.

Falcon Electric Booster Heaters Establish Direct Thermal Contact

Electric immersion type booster heaters for maintaining and increasing temperatures of a wide range of materials are produced by H. O. Swoboda, Inc., Thirteenth St., New Brighton, Pa. These "Falcon" heaters are available in capacities ranging from 10 kw. to as much as 1,000 kw. output. Consisting of bare spirally coiled heater strips, arranged to form a compact unit, the heater is installed in a sealed tank built in the pipe line bteween storage vessel and coating or saturating tank. Temperature is maintained uniformly by means of automatic controls, either thermostat or pyrometer with thermocouple. The heaters can be used with





Jim Eaton's speedboat is out hunting Japs . . .

She was a sleek mahogany runabout when she stole Jim Eaton's heart at the last motor boat show. But since then she has put on weight and been painted battleship gray. She is in the Navy now, patrolling a stretch of bay along the Pacific coast—part of an enormous fleet of patrol and picket boats, mine yawls and mosquito boats to which our builders of pleasure craft have turned their world-famous genius and facilities.

American builders of power boats know the meaning and methods of mass production. When they changed from yachts and runabouts to war craft the result was, not a trickle, but a swelling stream of boats for the Army, Navy and Marines.

When problems arose they were chiefly in adapting production methods to the new designs and special alloys required by war. In cooperation with Revere Technical Advisory staff, many famous boat builders made the change-over as smoothly as they would in producing a new model. For in addition to sound copper alloys, Revere supplies this service to help make manufacturing operations easier and quicker.

Every ounce of copper our country can produce goes directly into vital war materials. Fortunately, Revere is equipped with new plants, improved machines, advanced processes which add enormously to the nation's capacity to produce fine copper alloys. Not only are these plants working to the limit of their resources, but more facilities are steadily being added to bring the day of *victory* still nearer.

The Revere Technical Advisory Service functions in (1) developing new and better Revere materials to meet active or anticipated demands; (2) supplying specific and detailed knowledge of the properties of engineering and construction materials; (3) continuously observing developments of science and engineering for their utilization in producing methods and equipment; (4) helping industrial executives make use of data thus developed. This service is available to you, free.

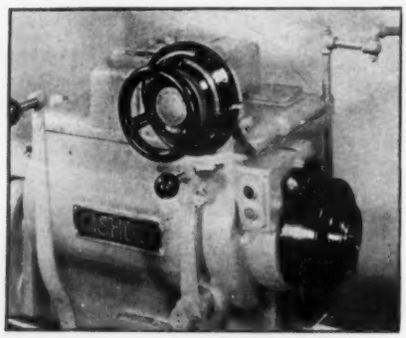
REVERE COPPER AND BRASS INCORPORATED

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK

materials which are non-conductors. Since the bare electric coils are immersed in the material to be heated, a direct thermal contact is established, and practically all heat is transferred to the material.

Eclipse Plastic Speed Selector Used in New Gisholt Lathe

A plastic dial and control wheel for the speed selector of the new Gisholt turret lathe has been introduced by Eclipse Moulded Products Co., Milwaukee, Wis. Any one of twelve available spindle speeds may be obtained by merely setting the speed desired on a special dial and the shift to the correct spindle speed is made automatically by the machine. The dial numbers



are made easy to read by the use of red on the inner dial and black for the outer dial.

Instead of the usual metal hand wheel, a 12-in. plastic wheel for longitudinal positioning of the cross-slide has been developed. In addition collet-chuck guards and various knobs and handles are also of this material.

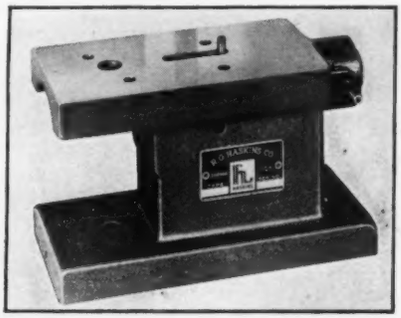
WIM Unit Quickly Takes Identification Pictures

Simple operation is the outstanding feature of the WIM identification unit announced by Photographic Equipment, Inc., 210 E. Park Way, Pittsburgh, Pa. By releasing the brake the entire photographic unit is moved up or down to center the subject, the button is pressed and the picture is taken without losing more than a few seconds of the worker's time. Standard cartridges of 35 mm. motion picture film are used, having 24 exposures. It is not necessary to complete a roll in order to have one or more pictures processed. About 1,000 pictures can be taken in an eight-hour day.

R. G. Haskins Develops Air-Controlled Holding Fixtures For Clamping Work in Air-Controlled Tapping Machines

Several air-operated holding fixtures have been developed by the R. G. Haskins Co., 615 S. California Ave., Chicago, Ill., for use with their air controlled tapping machines.

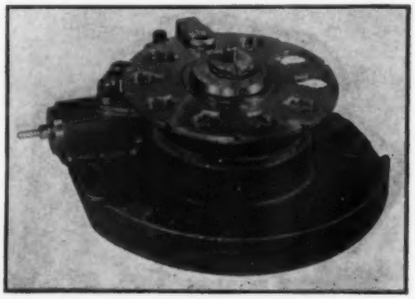
Where maximum production is desired in the tapping of either square or hexagonal nuts, their No. 643 air operated nut fixture is recommended.



This fixture is of the hand feed, magazine type. However, the positioning of the blank nut under the tap and the ejection of the tapped nut is entirely automatic, this operation being accomplished by an air operated plunger synchronized with the movement of the tap head.

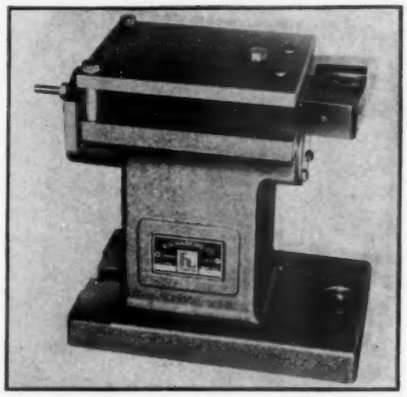
In the master base there is an air cylinder and a piston to which is attached a kicker bar. This bar slides in the holding fixture and transfers the nut from the bottom of the chute to the tapping position. The operation of the piston is synchronized with the vertical movement of the tap head through the medium of the automatic air valve which is part of the tapping machine equipment. The air consumption for the fixture is small.

The No. 556 dial feed fixture is adapted to handling a wide range of small parts such as nuts, die castings,



plastic parts, and odd-shaped stampings. The assembly illustrated consists of master base and index plate. The index plate is made from a standard blank plate and is adapted to handle the small brass stamping being tapped. Operation of the fixture is controlled by the automatic air valve on the machine, the indexing being synchronized with the vertical movement of the tap head. At the proper instant compressed air is admitted to the air cylinder. The plunger operates a V-shaped arm to which is attached the pawl. This pawl engages the index plate which is rotated clockwise until the pawl comes into contact with the stop. The pawl is locked between the stop and the notch in the index plate, holding the plate rigidly in place during the tapping operation. A friction disk under the beveled cap and knurled lock nut eliminates any possibility of back travel as the pawl returns.

The No. 600 air-operated vise fixture is a self-centering type of clamping device for holding parts in position for vertical tapping. It is an electrically controlled, air-operated fixture and its action is positive and instantaneous. Air at line pressure is admitted to the cylinder, driving the piston forward



and closing the vise jaws instantly. When the air pressure is relieved coil springs return the piston to its normal position and open the vise jaws. The air pressure can be reduced for handling light work such as parts made of thin wall tubing. The air for operating the vise is controlled electrically by means of a micro-switch and two solenoid valves operating on a low voltage circuit. Action is under control of the operator, who may secure either single cycle or automatic, continuous cycle operation of the tap head, synchronized with the operation of the vise.

The X-11 Piece Part Control Fixture controls the automatic air valve, with the result that the tapping cycle is started by the insertion of the part into the fixture, rather than by the operation of a foot pedal valve or other device. The master base contains a micro switch which is actuated by a piece part coming in contact with the pin projecting through the upper part of the base casting. The operator inserts the part into the fixture, and the tap head immediately moves downward, starting the cycle. As soon as the tap engages the piece, the operator releases the part which is then held in position in the fixture by the tap. As soon as the tapping is completed the head moves upward and the

TAKE *Guesswork* OUT OF PRODUCTION

Put SUNOCO EMULSIFYING CUTTING OIL to work . . . for long tool life . . . accuracy . . . fine finish

Victory production — the steady stream of machined parts for finished war products — isn't achieved by guessing. The selection of the proper tool set-up, correct speeds and feeds, and the right application of the right cutting lubricant are all important for machine tool operation at rated capacity-plus.

That's why so many leading plants throughout the nation rely on Sunoco Emulsifying Cutting Oil and the recommendations of Sun Oil Engineers to meet their cutting oil needs.

Sunoco's exceptional heat-absorbing and lubricating qualities permit longer tool life, "nth" degree accuracy, and fine surface finish.

Sun Oil Engineers — those capable Doctors of Industry — offer you technical service based on scientific training and practical experience that will help you solve your machining problems. Their recommendations are not guesswork. They stand ready . . . willing . . . and able to help you in your plant. For helpful case histories on how they aided other leaders in the metal working industry, write for your free copy of "Helping Industry Help America."

SUN OIL COMPANY • Philadelphia, Pa.

Sun Oil Company Ltd., Toronto

LET'S GO! U.S.A. KEEP 'EM FLYING!

PERFORMANCE DATA

OPERATION—Tapping ring nuts.

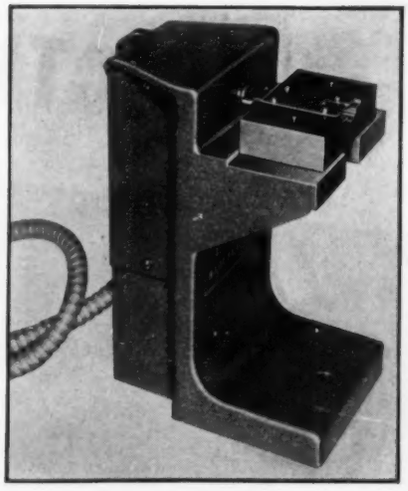
MACHINE—3-L Gisholt Turret Lathe.

MATERIAL—Forged steel.

CUTTING LUBRICANT—1 part Sunoco to 15 parts water.

SUNOCO

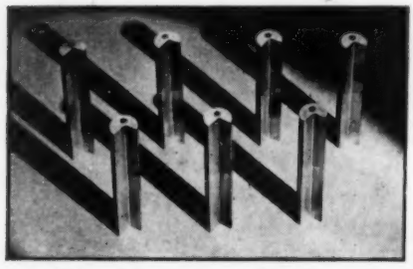
SUN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERICA



part is ejected automatically from the fixture. The operator, having no other controls to manipulate, having both hands free to handle the work, soon develops a remarkable rate of speed in feeding parts.

Carboloy-Tipped Gun Drills Reduce Machine Down-Time

Gun drills furnished with a Carboloy tip brazed to a short steel shank for attachment to regular gun drill tubes have been introduced by Carboloy Co., Inc., Detroit, Mich. These drills are designed for gun drilling of 30 and 50 caliber and 20-mm. gun barrels, and have an advantage in greatly reducing



down-time for changing drills. Greater wear-resisting qualities result in less wear on the outside diameter of the tip. In case of breakage the barrel may be reclaimed. Usually a broken steel drill freezes to the barrel, resulting in total loss. Drills may be placed in production without other changes in equipment with the exception of feeds and speeds.

George Scherr Tool Stand Holds Measuring Instrument

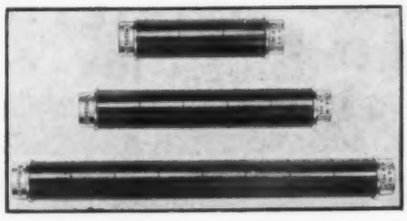
A tool stand for the purpose of holding micrometers, snap gages and other tools has been announced by George Scherr Co., 128 Lafayette St., New York, N. Y. Serving as a vise or clamp it prevents heat which the hand would transmit to the frame from expanding and distorting instruments used for accurate measurement.

The stand has been developed for securely holding the micrometer or snap gage without damage to the finish of the frame. The jaws are parallel, without serrations, and may be swiveled from vertical position to horizontal.

The base is made of cast iron, the jaws of cold-rolled steel. The use of this type stand frees both hands for checking the work and thus resulting in speed-up in gaging in addition to reducing fatigue.

Westinghouse Sectional Resister Has Electrostatic Shielding

For use in railway service, radio circuits, power rectifiers and laboratories, for measuring any high voltage circuits at 250 to 30,000 volts, a new sectional resistor is announced by the Westinghouse Meter Div., Newark, N. J. The unit is designed to replace in certain cases, the old box type resistor which had a high power consumption and was inconvenient to install or replace.



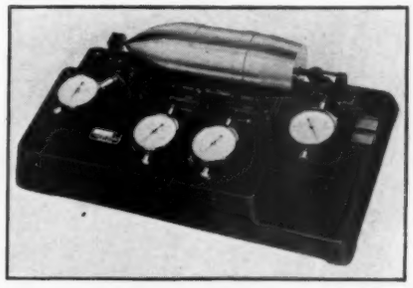
Two nickel-plated brass shield cups are slipped over the ceramic resistor spool before the outer cover is molded on. The cups, together with a phenolic retainer ring, prevent the molded material from coming in contact with the spool during the molding process, and also provide electrotatic shielding. Resistance is held within close tolerances permitting interchangeability of units having the same voltage rating.

Resistoflex Industrial Aprons Impervious to Cutting Oils

Aprons which are immune to all oils and organic solvents, including insoluble sulphur-base cutting oils, are announced by the Resistoflex Corp., Belleville, N. J. The aprons are made of strong, pretreated fabric, heavily coated with flexible Resistoflex PVA material which retains the flexibility of the fabric base but renders it impervious to the chemicals and solvents encountered in many industrial operations.

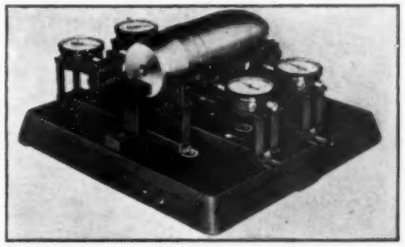
Federal Products Shell Gages Require No Outside Connections

Two inspection gages have been announced by Federal Products Corp., 1144 Eddy St., Providence, R. I., the Model 205 B-84 shell concentricity gage for checking the concentricity of various points with the shell body and at the same time the fuse hole or tracer cavity; the Model 236 B-95 shell diameter gage for checking diameters of shells and projectiles.



This shell concentricity gage also checks the fuse hole or tracer cavity

The Model 205 B-84 gage is equipped with a sliding indicator and pantograph unit. A stop is provided to locate



Indicators contact the shell through pantograph units in this gage

PROMPT DELIVERY IS ONLY ONE WARTIME FEATURE

ON TODAY'S rush production schedules, *ready availability* is an outstanding feature of the Torrington Needle Bearing. Thanks to a program of steady expansion, Needle Bearings can be delivered promptly in standard sizes and types *on all priority orders.*

But the features that first won industry-recognition for the Needle Bearing are now important wartime advantages, too. See if you don't agree that each one fills an immediate need, simplifying your product design and speeding production.

YOU SAVE TIME installing the Needle Bearing. It is built as a single compact unit. One quick operation presses it into place in the housing. Here is modern design for today's high speed production line methods.

YOU CONSERVE VITAL MATERIALS. The Needle Bearing's small outside diameter represents a material saving in itself. And this in turn enables you to reduce the size of surrounding members, conserving still more materials for needed use elsewhere.

YOU ELIMINATE EXTRA PARTS and assembly steps. The Needle Bearing stays in place without the aid of retaining rings, washers or end plates. And efficient lubrication eliminates the need for all but occasional renewal of lubricant. Both of which again save vital materials.

YOU IMPROVE PRODUCT PERFORMANCE. The Needle Bearing's high load capacity, low power consumption and long life make improvements possible in your product design and operation, reducing manufacturing costs.

These advantages of the Needle Bearing—proven conclusively in thousands of applications—can help you guard against production delays that are more costly now than ever. Find out from a Torrington engineer how easily this unique bearing, available for prompt shipment on priority orders, can be adapted to your wartime designs. Complete details are available in Catalog No. 105, Write, wire or phone for your copy today.

THE TORRINGTON COMPANY
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Makers of Needle and Ball Bearings
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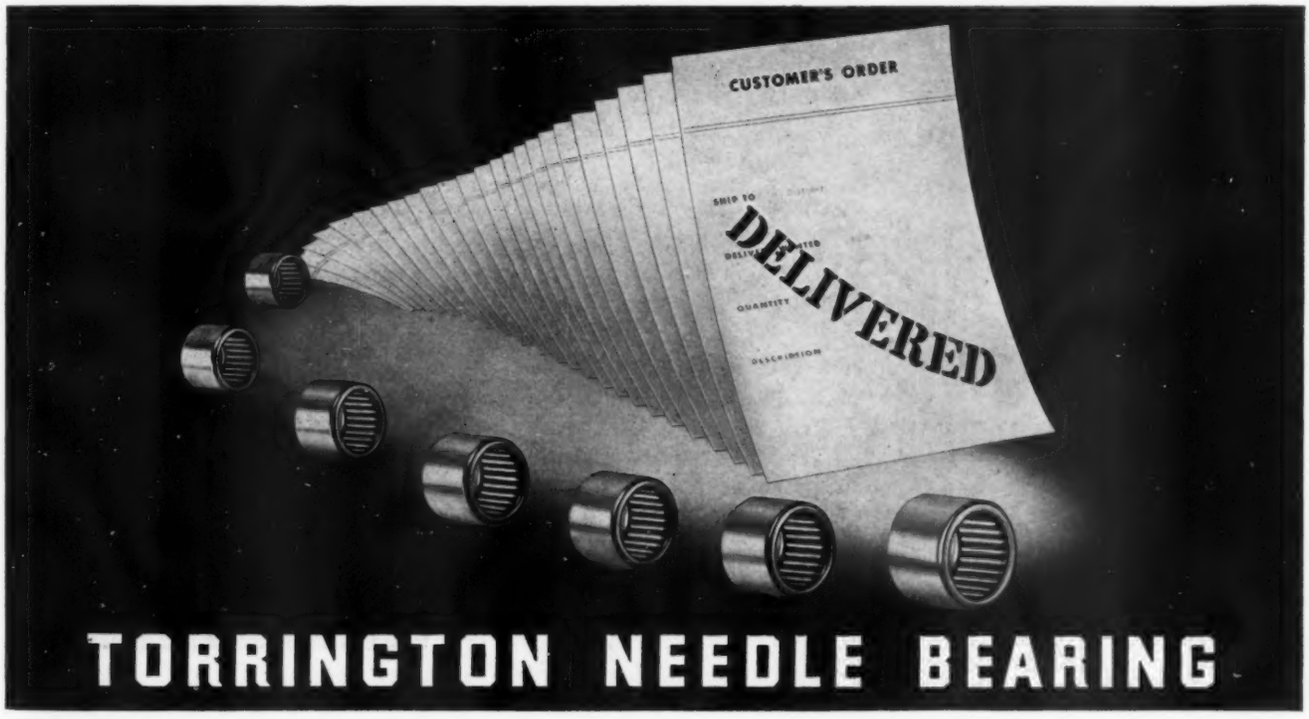
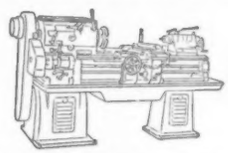
LET'S GO! U.S.A. KEEP 'EM FLYING



TORRINGTON NEEDLE BEARING

LOW MAINTENANCE COST



Used in the feed boxes of 12-inch to 18-inch heavy-duty and 17-inch to 24-inch Regal lathes manufactured by The R. K. LeBlond Machine Tool Co., Needle Bearings reduce the need for maintenance attention, because of their simple, effective system of lubrication and their long life.

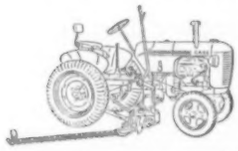
R. K. LEBLOND

HIGH-SPEED OPERATION

35 Torrington Needle Bearings are used in construction of 600 ampere, 1,500,000 Kva outdoor type oil circuit breakers built by Allis-Chalmers Manufacturing Company. Located at key points in mechanism, the Needle Bearings aid in maintaining high-speed operation.

ALLIS-CHALMERS

INCREASED EFFICIENCY



Needle Bearings on power lift shafts and in universal joints on propeller shafts increase operating efficiency and conserve power in the No. 14 Case-Detroit Highway Mower. In addition, the Needle Bearings provide high load capacity for both oscillating and rotating service.

CASE-DETROIT

contact point at the desired position in the fuse hole.

Four diameters can be checked independently of each other with Model 236 B-95 gage. Indicators do not contact the shell directly but through use of pantograph spring units which protect the indicators and make adjustments easier. Shells and projectiles up to approximately 14 lb. can be rotated manually. Both gages are entirely mechanical thus requiring no electrical or air connections.

Speed Calculator Supplied With Cincinnati Dial-Type Millers

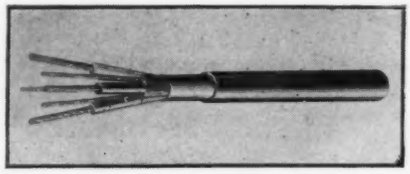
Operators can select the correct spindle speed for any combination of work and tool materials and cutter diameter, without guess work or paper work, by using the built-in milling speed calculator now supplied with dial-type milling machines built by the Cincinnati Milling Machine Co., Cincinnati, Ohio.

The calculator is a circular slide rule designed especially to solve this particular type of problem. No knowledge of mathematics is needed. It consists of one stationary and two rotating disks, with a semi-circular cover plate in which are two windows. All of the r.p.m. values given on the calculator are those available on the milling machine to which it is attached.

GE Flamenol Cable Fills Machine Tool Requirements

A non-rubber flexible Flamenol Busdrop Cable for 600-volt branch circuits has been announced by the Wire and Cable Div., General Electric Co., Schenectady, N. Y. Flamenol cable has properties of high resistance to oils, acids, alkalies, and coolants. It will not support flame, is easy to handle, easy to bend, and is resistant to abrasion.

The conductors are soft-drawn, dry-bright-annealed, stranded copper. They are protected by a coating of tin or other suitable material. Each conductor is insulated with synthetic material. The three insulated conductors are twisted together with the ground wires, in combination with dry jute in each interstice, to provide a hard, compact core. Over this core is applied



a tape and a jacket of the same synthetic insulation. Flamenol wire is intended for operation under the severe operating conditions required of machine-tool wiring.

One Side of Gibson Contact Coated With Silver Solder

Contacts which are coated on one side with silver solder so that they may be applied immediately to the terminal are produced by the Gibson Electric Co., 8362 Frankstown Ave., Pittsburgh, Pa. The contact is simply placed on the terminal and brazed in an electric welder, eliminating the extra operation of placing a separate piece of solder between the contact and the terminal.

Time is saved, and a uniform distribution of solder in the joint between the contact and the terminal is assured. Complicated contact assemblies, which are difficult to make when a separate piece of solder is required, are easily brazed with solder-flushed contacts.

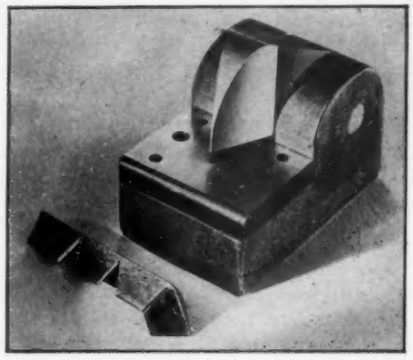
Fine-Texture Abrasive Wheels Produced by Weldon Roberts

An additional line of "Brightboy" abrasive wheels of finer texture has been announced by Weldon Roberts Rubber Co., Brightboy Industrial Div., 93-99 N. 13th St., Newark, N. J.

The Brightboy Finetex wheel is a smoother, finer texture tool for use in more delicate work in producing special finishes and polishes. The small wheels are made in sizes from ½ to 1 in. diameter and the larger ones in diameters from 1½ to 5 in.

Wales Notching Dies Will Maintain Constant Alignment

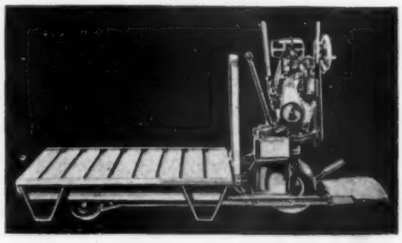
Wales notching dies, designed to notch 11-gage angle iron right up to the leg, are announced by the Strippit Corp., Buffalo, N. Y. The dies are self-contained with the punch and die in constant alignment. In the case of an angle to be bent, the Wales



notching dies leave a portion of metal unnotched in the corner to permit easy and exact bending into position for simplified welding of the legs. Flexibility of the dies makes it possible to set up patterns by positioning the holders to a templet and then locking them onto a T-slotted plate.

"Truck-Man" Moves Material Through Plant, Easily Reversed

For moving material which can not be handled on a conveyor, Yard-Man, Inc., Jackson, Mich., has brought out a simple motorized machine known as the "Truck-Man." Anyone in the plant



can learn to operate the machine in a short time. It turns in its own length and is easily reversed by rotating the power unit 180 deg., operating with equal ease in either direction. Its capacity is 2,000 lb.

The 1½-hp. motor is readily accessible for repair and can be replaced in ten minutes by removing four bolts. It has ½-gal gasoline capacity.

Bearing Assemblies Improved In Vernon Horizontal Miller

Improvements in the Vernon No. 0 horizontal milling machine announced by Machinery Manufacturing Co., 1915 E. 51st St., Vernon, Los Angeles, Calif., include labyrinth housings for the spindle bearings, double rows of bearings

Pipe Bending Presses

for America's Shipyards

MOST BENDS can be made cold on this powerful 200-ton Southwark hydraulic pipe bending press. Time required for heating the pipe is saved and distortion of bend due to cooling shrinkage is eliminated.

Self-contained, this oil operated Southwark hydraulic press is under perfect control of the operator at all times — a feature particularly valuable during difficult bends. Southwark pipe bending presses are time and money savers.

Southwark builds a complete line of shipbuilding machinery including bending rolls, plate planers, keel benders, sectional flanging presses and joggling presses. New designs in these hydraulic presses and power tools are helping shipbuilders do a better job faster. Write for Bulletin K-160 which illustrates many of these products.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco, California.

BALDWIN

Southwark

DIVISION OF THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA

THEIR HIDES ARE GETTING TOUGHER and TOUGHER..

...placing added emphasis on the importance of using the right cutting and drawing lubricants for armor plate

• These time-tested Stuart Oil Products are in wide use at principal tank building plants. Detailed application information is yours for the asking.

•

Stuart's Thred Kut "99" — where straight cutting oil is indicated

Stuart's SOLVOL LIQUID CUTTING COMPOUND — for carbide tools and where an "aquamix" solution is recommended

Stuart's "SUPER-KOOL" — for deep drawing, stamping, etc.

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • Est. 1865

Warehouses in All Principal Metal Working Centers

on cross and longitudinal lead screws, accurately balanced spindle drive pulleys of increased size, enlarged power feed pulleys from "O" to "A" and more substantial power feed bracket.

Other features developed are a heavier knee, tapered gibs throughout, additional 2½ in. column height, 4 in. longer overarm, handwheels to replace lead screw cranks, new type pedestal and larger chip pan.

NEW MATERIALS

National Graphite Develops Colloidal Coating Process

Natural colloidal graphite, which produces a tough graphite skin on bearings is now available in this country. Formerly imported from Germany, American research has solved the problem of reducing natural graphite to colloidal size at a critical time. The National Graphite Co., Inc., 17 John St., New York City, offers colloidal graphite suspension for many applications, including light fuel.

The graphoid "skin" produced on bearings is tough and durable, and when steadily surfaced with more graphite blended in the regular lubrication, the graphite film takes the wear, preserving the metal. Machines last longer, often twice as long, it is said. Graphite is especially useful in breaking-in new machines.

du Pont Electrotinning Process Conserves Both Tin and Power

Both tin and electric power are conserved by an electrolytic process for plating strip steel with tin, which was announced by the Electroplating Division, E. I. du Pont de Nemours & Co., Wilmington, Del. Known as the Halogen Tin Process, it employs a neutral solution which eliminates sludging and the consequent waste of tin. Strip steel for containers can be tin-plated rapidly with less electric power by this process.

A thinner, uniform coat of tin can be applied to strip steel electrolytically resulting in savings of from 40 to 65 percent of the tin normally used. Tin deposited by the Halogen process can be heated without discoloration either when obtaining the bright finish required by some can manufacturers or during the process of applying lacquers or enamels.

Low Tungsten-Molybdenum Alloy Offered by Jessop Steel Co.

A low tungsten-molybdenum steel, known as TCM High-Speed Steel, intended to replace 18-41-1 is announced by the Jessop Steel Co., 595 Green St., Washington, Pa. No change in operating equipment is necessary in using this steel. It has a slightly lower hardening temperature. TCM steel is lighter in weight than 18-4-1.

Copper Alloys Are Simply Blackened by Enthone Process

A process for direct low-temperature chemical blackening of copper and copper alloys has been developed by the Enthone Co., 442 Elm St., New Haven, Conn. Known as Ebonol C, the process involves immersion in a solution of blackening salts operated near the boiling point. The blackening is accomplished in from 2 to 10 min., depending upon the alloy. The coating is essentially cupric oxide, and being integral with the base metal, it cannot chip or flake. In addition to being jet black, the coating is hard enough to be buffed and does not have to be lacquered to prevent wear.

TRADE PUBLICATIONS

AIR COMPRESSORS Schramm stationary air compressors are illustrated and described in Catalog 42-S published by Schramm, Inc., West Chester, Pa.

AIR CONDITIONING A bulletin entitled "What Dorex Absorbers Mean to Air Conditioning" has been prepared by W. B. Connor Engineering Corp., Dorex Division, 114 East 32nd St., New York, N. Y.

ALUMINUM ALLOY The National Bronze & Aluminum Foundry Co., Cleveland, Ohio, describes the uses of T-1 aluminum alloy in a four-page folder.

BEARING COVERS Standard covers for ball and roller bearings are described in four-page Bulletin No. 11-C offered by R-S Products Corp., Wayne Junction, Philadelphia, Pa.

BRONZE SPECIFICATIONS A revised "Table of Bronze Specifications to Government Requirements" is offered by Ampco Metal, Inc., 1745 South 38th St., Milwaukee, Wis.

CABLE General Electric Co., Schenectady, N. Y., has issued an eleven-page illustrated booklet describing No. 1799 varnished-cambric-insulated cable.

CHROMIUM PLATING A 16-page booklet entitled "Hard Chromium Plating" recently published by Middlesex Gauge & Tool Corp., Woodbridge Ave., Fords, N. J., discusses briefly the important qualities of hard chromium plating and lists a wide variety of applications that are of particular interest at the present time.

DEFENSE PRODUCTS Caterpillar Tractor Co., Peoria, Ill., has prepared a 32-page illustrated booklet describing defense products, entitled "Caterpillar Diesel . . . on Guard!"

DIE CASTING MACHINES The Phoenix Machine Co., 2701-2711 Church

Advertisement

Warehouse Stocks of Steel Proving Big Help in Keeping Manufacturers Operating

A recent survey of industries indicates that most manufacturers are relying on nearby steel-service plants, more than ever before, to fill their requirements for small lots of steel. The leading company in this steel stock service is Joseph T. Ryerson & Son, Inc., who operate a vital network of 10 plants strategically located in busy industrial centers across the country.

The close cooperation between Ryerson's 10 plants offers two unique advantages.

First—Jobs at distant points; or the steel requirements of branch plants can be more quickly handled through local Ryerson offices. A local Ryerson office will take immediate action to assure prompt shipment.

Second—The local Ryerson office handles that *all important* "follow through" which assures prompt, accurate deliveries. Bring your steel needs or problems to Ryerson for prompt, intelligent cooperation. Phone your nearest Ryerson Steel-Service office. (See advertisement below.)

★There IS Something you can do to get STEEL more quickly!

Steel deliveries are a problem! Stocks are depleted, mill deliveries delayed, priorities strictly enforced, demands heavier as war production intensifies! But there *is* something you can do about it—several things, in fact! Work closely with Ryerson on your requirements, and follow the common sense rules of action.

1 Make sure of your priority status.

(a) If you are engaged in direct war production and require immediate stock shipments from time to time, be sure to properly extend to us applicable priority ratings. This should be done by extending any blanket rating in the manner required by the blanket under which you are operating or by properly endorsing purchase orders, as in the case of priority ratings based on certificates.

(b) If you are not directly engaged in war production work, check up on the proper rating for your repair and maintenance requirements, because effective after May 4, a new order, amendment No. 4, supplementary to General Preference Order M-21-b, establishes closer control and greater limitations on the distribution of steel.

2 Because of the importance of following Government regulations to the letter, make sure that your orders are formally endorsed, using the proper forms when necessary. This will preclude the possibility of further correspondence that might delay shipment, or prior sale of material.

3 When possible, send orders — not inquiries. This is entirely safe because of the long-established Ryerson one-price policy. It is possible the steel, if in stock, might be sold while we are answering your inquiry.

4 Whenever practicable, state what alternate sizes, shapes, or types of steel you can use if the desired steel is not in stock.

5 It is also helpful to indicate the size or length to which the steel will be cut so that we may fit your requirements to available sizes and lengths when regular sizes and lengths are not in stock.

We are most anxious to help you with every problem of steel procurement or application, during these critical days! Do not hesitate to keep closely in touch with us.

JOSEPH T. RYERSON & SON, INC. · CHICAGO · MILWAUKEE · DETROIT · ST. LOUIS · BUFFALO · BOSTON · CINCINNATI · CLEVELAND · JERSEY CITY · PHILADELPHIA

IT'S EASY

WHEN YOU KNOW HOW

—JUST LIKE GETTING

LONGER MOTOR LIFE

WITH WESTINGHOUSE

SEALED SLEEVE

BEARING MOTORS

—AND THAT'S JUST

ONE WAY THEY'RE

YEARS

AHEAD!

J-21238

WESTINGHOUSE

SEE PAGE 48

AND PAGE 49

Ave., Cleveland, Ohio, has prepared a bulletin describing the complete line of Lester-Phoenix die casting machines for zinc, tin, aluminum, brass and magnesium.

DIESEL ENGINES Bulletin No. 71, issued by Pennsylvania Flexible Metallic Tubing Co., 72nd St. and Powers Lane, Philadelphia, Pa., gives 1942 standard data on penflex all metal flexible pipes for diesel installations.

LATHES The Cincinnati Lathe & Tool Co., 3207 Disney St., Oakley, Cincinnati, Ohio, offers a four-page folder describing geared and maxi-production lathes.

MAGAZINE The Axelson Manufacturing Co., 6160 South Boyle Ave., Los Angeles, Calif., has resumed publication of the "Axelson Contact."

PLANER DRIVES A four-page folder, B-3064, describing variable voltage planer drives with a 30 to 1 speed range is offered by Westinghouse Electric & Manufacturing Co., Department 7-N-20, East Pittsburgh, Pa.

PUMPS Thrustfre multi-stage centrifugal pumps are described in Bulletin No. 238 issued by Pennsylvania Pump & Compressor Co., Easton, Pa.

RESPIRATORS H. S. Cover, Station A, South Bend, Ind., has prepared a literature and price list on the Dupor respirator.

RUBBER PRODUCTS The B. F. Goodrich Co., Akron, Ohio, has completed the publication of a series of six pamphlets on the subject of "How to Get the Most Out of Industrial Rubber Products."

WAR PRODUCTION Factual information on metal-working, heat-treating and machining of armament is given in the fifth edition of "War Production Data from the Houghton Line" published by E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia, Pa.

WIRING Ten ways to speed up wiring jobs are described and illustrated by the Ideal Commutator Dresser Co., 1280 Park Ave., Sycamore, Ill., in a four-page bulletin.

Projectile Surfaces

It is easy to understand why a close dimensional tolerance and a fine surface finish is necessary on the bourrelet, since this surface is the only part of the steel body that touches the bore of the gun as the projectile passes through the barrel.

A number of production engineers, however, have considered fine finish on the body of the shell and on the ogive unnecessarily expensive, both in time and money, since these surfaces do not come in contact with the gun at any time. Exhaustive tests have shown that the skin effect, or friction developed as the projectile passes through the air, is materially reduced when the projectile has a relatively smooth finish. Air turbulence is minimized and effective range increased when the outside surfaces of the projectile have a smooth finish. Even though it takes considerably more time to produce this finish, and it is sometimes difficult to make the coat of paint stick well on such surfaces, they are amply justified by results obtained in the field.

It is essential, also, that the base of the shell be finished carefully, in order that a good weld will be secured when applying the base plate. The weld joining the base plate to the body of the shell must be gas tight, and a smooth surface on the base aids materially in producing such a weld.

Utilizing Punch Press Equipment

A careful study of the machine facilities of the country shows a predominance of punch presses. These are used normally in all sorts of industries from metal toys to pots and pans for household use and for steel furniture, cabinets for ice boxes, gas and electric stoves, and even the apparatus used in beauty parlors for hair drying and other aids to feminine beauty. One of the tough problems of those charged with the conversion of industries to war work is to find work for these presses.

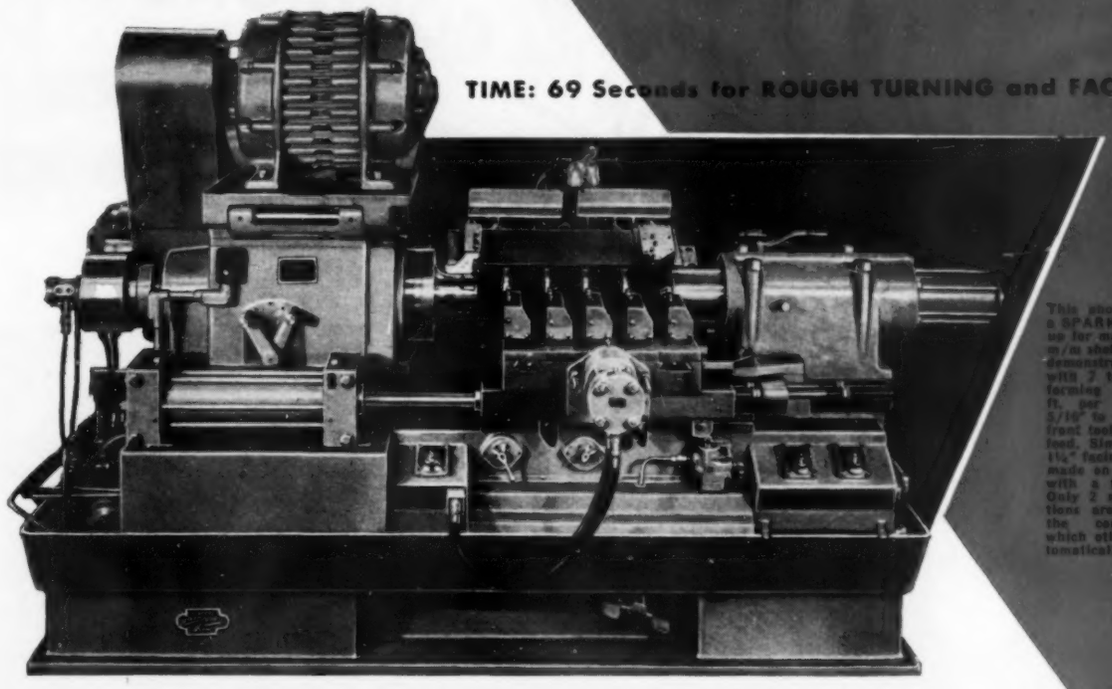
Some versatile press owners have had the initiative to find needed parts that are now made of forgings or castings and produce them of sheet metal. This plan can be extended in many directions. Handles and levers used on machines of many kinds can be made from sheet steel. They can be formed in one or more parts and welded to the desired form. If threads are needed, it is an easy matter to weld a nut in position in the lever.

There are also numerous parts of various items used by ordnance now made from forgings, which could be made from sheet or strip metal in a punch press. Shop men who have punch press facilities will do well to study as many items as possible with a view to making them on their equipment. In one case at least the shop owner, seeing possibilities in one small part, made up a few samples and submitted them for approval. The idea was promptly accepted and he is now busy making thousands of these parts.

This is a case where "God helps those who help themselves." Men who have designed parts to be made of castings or forgings are not likely to visualize the use of other materials. Men with press equipment must pioneer new methods if they want to get into production on war materials. It may not be necessary to make a part if it involves too much expense. But they must work out their own plans for conversion.

★ SPARKS SEMI-AUTOMATIC HYDRA-FEED LATHE

TIME: 69 Seconds for ROUGH TURNING and FACING



This photograph shows a SPARKS LATHE set up for machining a 155 m/m shell. It has been demonstrated equipped with 7 tools and performing speed of 310 ft. per min. with a 5/16" to ½" cut on the front tools using a .054 feed. Simultaneously a 1¼" facing cut is being made on the base end with a feed of .026". Only 2 manual operations are required for the complete cycle which otherwise is automatically performed.

DESIGNED PARTICULARLY FOR FAST ACCURATE ROUGH AND FINISH WORK ON SHELL BODIES from 75 m/m to 8"

The following roughing and finishing operations are handled on the SPARKS LATHE:

. . . rough turning of shell body, facing base end and cutting off to length

. . . boring and chamfering, reaming and chamfering; and recess

. . . finish turning outside of shell body and finish turning nose contour to bourrelet

. . . finish facing base and finish turning band seat

. . . machining rotating band

SEND FOR BULLETIN GIVING COMPLETE INFORMATION . . . .

MODERN FEATURES ASSURE LONG-LIVED ACCURACY AND CONVENIENT OPERATION

Headstock: Four speed geared; steel gears heat-treated; forged steel pinions hardened

Spindle: Hollow and ground forged steel mounted front and back on Timken bearings

Carriage: Heavily ribbed with extra bridge for supporting multiple tooling attachments

Bed: Sturdy and heavily ribbed

Tail Stock: Heavy duty; special heat treated quill, accurately ground; traverse movement of quill hydraulically controlled

Cutting Feeds: Changed quickly by convenient feed dials

SEND AT ONCE FOR BULLETIN GIVING COMPLETE INFORMATION

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

HYDRO-

OTHER HOUGHTON PRODUCTS

Carburizers
Quenching Oils
Drawing Compounds
Rust Preventives
Specialized Lubricants
Heat Treating Salts
Metal Cleaners
Pickling Inhibitors
Core Oils
Cutting Oils

Have you a production problem with your hydraulically controlled broach, or gear cutter, or press?

Do you have trouble getting close finishing cuts on a lathe, or grinder?

If the operation of any of your hydraulically equipped machines is less smooth, less efficient than when they were new, then you need HYDRO-DRIVE MIH, Houghton's series of Hydraulic Oils which is new in name only.

Today Hydro-Drive is helping thousands of machine tools of many kinds to operate faster, more accurately, and more economically.

Developed specifically to overcome the weaknesses of former hydraulic oils, Hydro-Drive

E. F. HOUGHT

E. P. HYDRAULIC OILS

by Houghton

PROVEN TO MEET TODAY'S MOST DRASTIC SERVICE CONDITIONS

-DRIVE MIH

has three outstanding properties, the result of Houghton's unique, patent processing:

1. Hydro-Drive protects parts with a tough lubricating film three times stronger than that of ordinary hydraulic oils.
2. Hydro-Drive has greatly improved oxidation stability, which increases its resistance to the effects of pressure, heat, moisture and agitation.
3. Hydro-Drive has unusual solvent ability, which prevents deposition of gum and sludge on pumps, control valves, filters and other working parts.

The Hydro-Drive MIH series of hydraulic oils is specially fortified with synthetic organic compounds to accomplish those three aims. Throughout industry, high performance values have been proved by actual comparisons with the best of straight mineral oils.

The Houghton Laboratories control the make-up and treatment of the best selected stocks. Our Technical Staff conducts comparative tests against other oils, taking drainings at regular production intervals, to prove stability and long useful life of Hydro-Drive. Such tests can be readily arranged in your plant without interfering with production.

Write for full details and prices of Hydro-Drive Hydraulic Oils. E. F. Houghton & Co., Philadelphia, Chicago, Cleveland or Detroit.

TON & CO.

CHICAGO
PHILADELPHIA
DETROIT

LATROBE

Metallurgical Service

...to help solve your tool steel problems

LESCO

★ Maximum Production is the goal of all industry today!

You can rely on the qualified assistance of an experienced *Latrobe* Metallurgical Engineer to help you secure *maximum production* from the tool steels you use. It's an advisory service —designed to lend co-operation NOW *when you need it most*, and without obligation on your part.

You may have a problem of selection, or of application. Or perhaps you need to substitute one composition for another. Or it may be a matter of heat treating that proves perplexing.

In any event, feel free to call upon *Latrobe!*

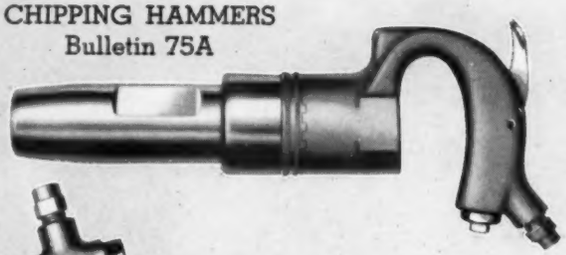
Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT •• LATROBE • PENNSYLVANIA

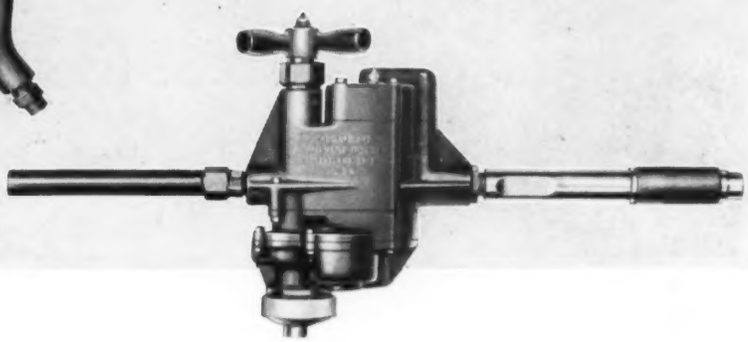
CLECO TOOLS

FOR *All-out* PRODUCTION

CHIPPING HAMMERS
Bulletin 75A



ROTARY DRILLS
Bulletin 83



SAND
RAMMERS
Bulletin 76A

FOR many major jobs in metal working, there is a Cleco Tool to help meet the urgent demand for faster, better production. Whatever is required — chippers, sand rammers, grinders, riveters, or drills — you can do it faster, with less air and less maintenance costs if you use Cleco Tools. A wide variety of sizes and styles — in the Cleco line there is the *right* tool for every job. All the accessories, too — Bowes couplings, valves, hose, etc. *Write for Bulletins.*

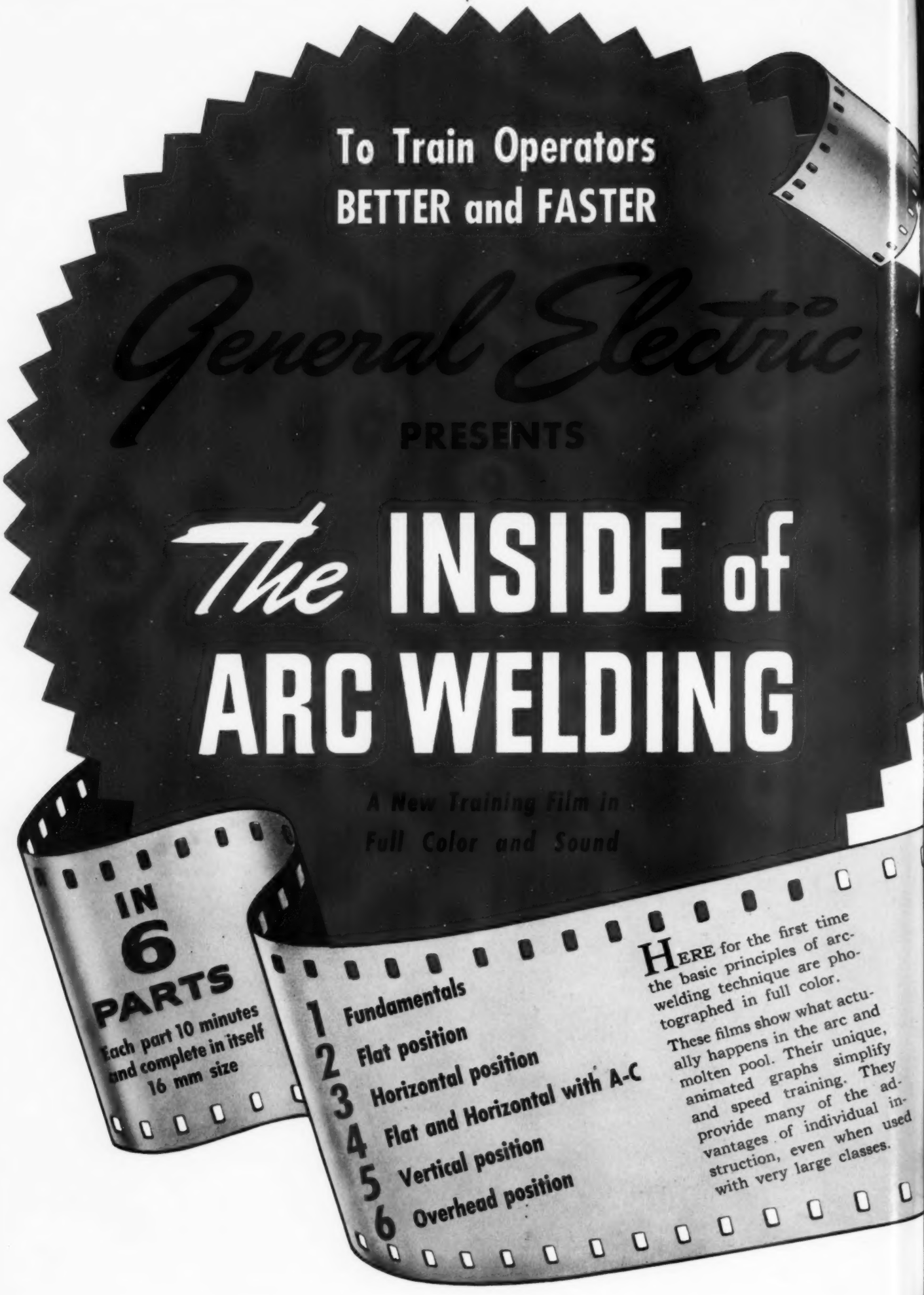
RIVETING HAMMERS
Bulletin 82

ROTARY GRINDERS
Bulletin 80

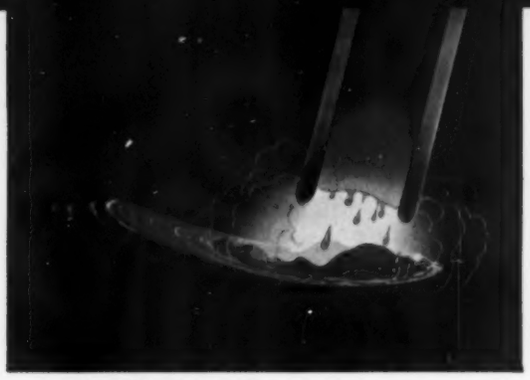
THE CLEVELAND PNEUMATIC TOOL CO.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

MARBLE AVE., AT EAST 77th ST. CLEVELAND, OHIO


To Train Operators
BETTER and FASTER
General Electric
PRESENTS
The INSIDE of
ARC WELDING
A New Training Film in
Full Color and Sound
IN
6
PARTS
Each part 10 minutes
and complete in itself
16 mm size
1 Fundamentals
2 Flat position
3 Horizontal position
4 Flat and Horizontal with A-C
5 Vertical position
6 Overhead position
HERE for the first time the basic principles of arc-welding technique are photographed in full color.
These films show what actually happens in the arc and molten pool. Their unique, animated graphs simplify and speed training. They provide many of the advantages of individual instruction, even when used with very large classes.

The arc and molten pool are shown in detail—made possible by a new technique developed by Raphael G. Wolff Studios of Hollywood. You see why electrode travel-speed and position are so important.



Animated cross sections show how the covering protects the arc and how the metal is melted off the electrode, mixed with the base metal, and deposited with a protective slag covering on the resultant weld.

Joe MaGee portrays, in animated cartoon portions, the groundless fears of the beginner at striking the arc, lending a humorous and effective bit of understanding and interpretation.

Experienced operators demonstrate the basic principles of shielded-arc welding. The use of movies makes it possible for all students in a large class to see these demonstrations close-up.

Quality welds, as well as poor ones, are illustrated by cross sections. The good and bad points of typical welds are shown by full-color shots, and their causes are fully explained.

All welding positions are thoroughly covered in these films. The use of a-c welding is explained in a simple, concise manner that will prove profitable to hundreds of shops looking for high-speed, high-quality production.

YOU CAN BUY these films at cost or—

YOU CAN BORROW prints for single showings. Just see your G-E arc-welding distributor or write Joe MaGee at nearest address listed:

Address: Joe MaGee, General Electric Co.,

187 Spring St., N.W., Atlanta, Ga.
140 Federal St., Boston, Mass.
840 So. Canal St., Chicago, Ill.
570 Lexington Ave., New York City
4966 Woodland Ave., Cleveland, Ohio
1901 N. Lamar St., Dallas, Texas
650 Seventeenth St., Denver, Colo.
212 N. Vignes St., Los Angeles, Calif.
1405 Locust St., Philadelphia, Pa.
920 S.W. Sixth Ave., Portland, Ore.
200 S. Main St., Salt Lake City, Utah
1 River Road, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

MAIL THIS COUPON NOW

Joe MaGee, General Electric Co.,

(Nearest Address)

☐ Please reserve Film No._____ for our use on date listed below. (Film No. 1 now available; the others will be released about June 20.)

1st choice_____ (date) 2nd choice_____ (date) 3rd choice_____ (date)

☐ Send me more details on these films and how I can obtain copies for my permanent use.

Organization .....

Your name .....

Street address ..... State .....

City .....

672-47-8748

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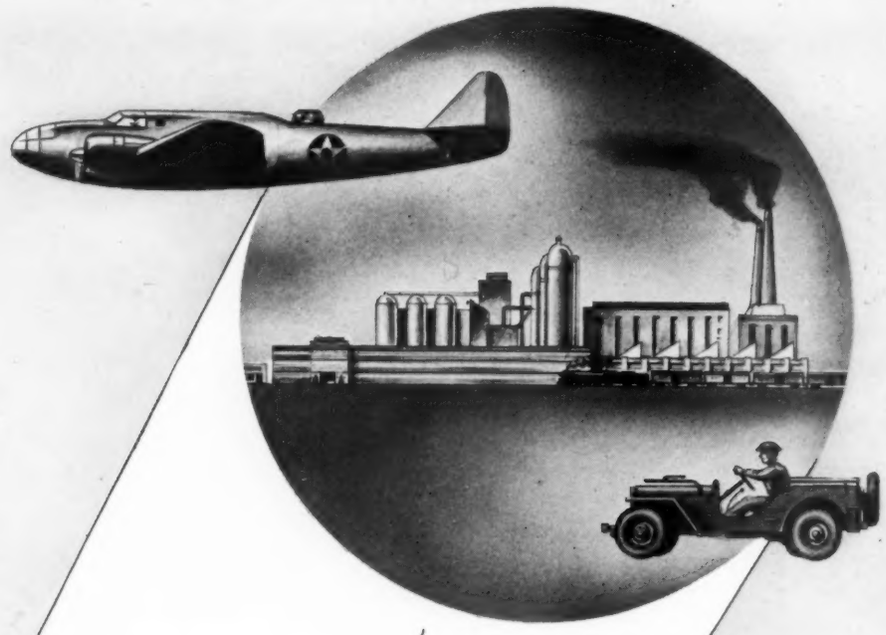
GENERAL ELECTRIC



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FEDERAL

BEARINGS

TRADE MARK

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

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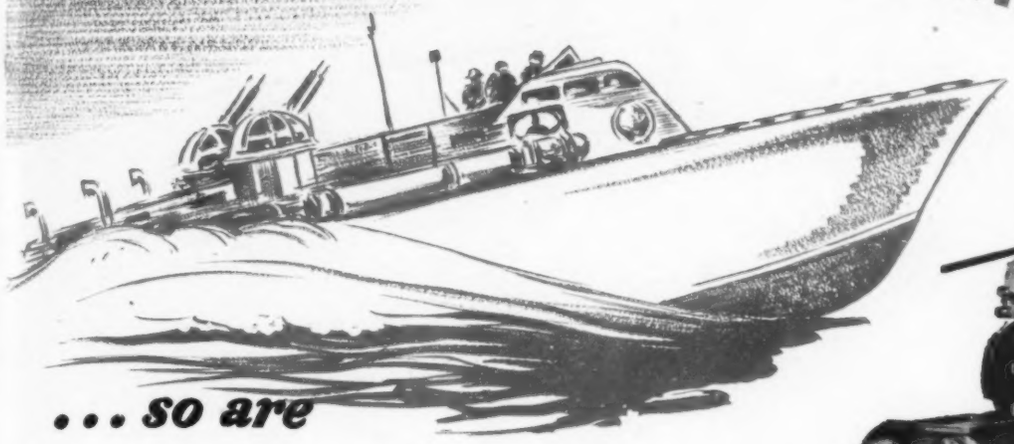
Chicago Office: 902 S. Wabash Ave. • Los Angeles Office: 5410 Wilshire Blvd.

SMALL IN SIZE— BIG IN PERFORMANCE!



. . . so are

DALZEN

• VERTICAL •

THREAD GRINDERS

43" WIDE
39" DEEP
72" HIGH

48" WIDE
38" DEEP
75" HIGH

The "mosquito boat" and modern machine tools are alike in one respect — *they're fighting machines!* Mosquito boats and Dalzens are *both* triumphs of design and construction for the work in hand . . . packing tremendous performance in small space. When it comes to thread grinding Dalzens DO MUCH MORE—TAKE LESS FLOOR.

Do much more • *take less floor*

Today two things are of paramount importance in American Industrial Plants: (1) more work, higher speeds and (2) most effective utilization of given floor space. Dalzens meet both requirements and you can use the saved floor space for added equipment or more efficient tool arrangement. Above you see Dalzen No. 2—grinds threads to 4" long anywhere on an 8" shaft, diameters up to 3". At left, Dalzen No. 1—grinds threads to 10" long anywhere on 18" shaft up to 6" diameters. Interested in more output in less space?

• ***Write for Bulletins***

Note: We also make the Dalzen Combination Center Lapping Machine and Drill Press—two machines in one for half the floor space.

DALZEN TOOL & MFG. CO.
12255 E. 8 Mile Road — Detroit, Mich.

IF you were judging by past volume, you were right. Industry was slow to take full advantage of the weight savings offered by this lightest of lightweight metals. But you were wrong if you were thinking of experience. American Magnesium Corporation has been fabricating Magnesium Products for over a quarter of a century.

Today, complicated castings for military uses are coming out of American Magnesium foundries by the ton, where demand was once counted in pounds. And so it is with all Mazlo Products; permanent mold and die castings, extruded bar and shapes, sheet, tubing and forgings. The doing, learning and improving that come of twenty-five years of working with Magnesium Alloys now make this wartime production possible.

Manufacturers who pioneered with us, adopting Magnesium Products, are now profiting by their foresight. Designing with Magnesium is enabling them to improve performance of vital war equipment and speed up its production.

Our engineers will gladly work with you. Sales Agent for Mazlo Magnesium Products: Aluminum Company of America, 1709 Gulf Building, Pittsburgh, Pennsylvania.

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

MAZLO MAGNESIUM PRODUCTS

Scorching Heat or Freezing Cold... **wherever goods of war must go... Protect Them with FIBREEN**

Planes, tanks, guns, trucks, ammunition, food, clothing, medical supplies and vital repair parts that pour from American production lines, *may see service from the arctic circle to the equator.* They may be weeks at sea—stand long outside exposure to freezing cold, to water, to snow and ice, or steaming tropical heat, and destructive sand, dust and dirt.

But when the time comes to go into action, these materials of war must be undamaged—ready.

That's why protective packing is of such major importance now. And that's where FIBREEN is doing an outstanding job in the nation's war program. This rugged paper does its job under any temperature—is unbelievably tough, and is completely proof against moisture, wind and dirt.

It's reenforced with two crossed layers of wire-strong, closely spaced fibres, embedded with two layers of special asphalt between two layers of clean, strong kraft. FIBREEN is pliable and easy to handle—a perfect wrapping or lining material—a superior, low-cost replacement for fabrics and other materials now impossible to get.

FIBREEN is being supplied for the wartime needs of the nation. If you are making an essential war product—if unfailing protection in shipment and storage is a problem—we invite your inquiry. Write for samples. Tell us what you make and how you pack it. Our packing experts are ready to help you, without obligation.

THE SISALKRAFT CO.

Manufacturers of Sisalkraft, Fibreen, Sisal-X, Sisaltape and Copper-Armored Sisalkraft.

205 W. WACKER DRIVE · CHICAGO, ILL.

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FIBREEN

EFFECTIVE *Protection* IN TRANSIT—IN STORAGE—FOR EMERGENCY USES

SERVING INDUSTRY, CONSTRUCTION AND AGRICULTURE THROUGHOUT THE WORLD

We Serve You by Serving National Defense

Twenty-four hours a day, seven days a week, we're making drop, upset and steam hammer forgings for building the enormous offensive and defensive machine needed to assure victory for our nation. One day is like another in our haste to meet the demands of all-out war.

Naturally, some of our friends who are makers of consumer goods cannot be served. Too, the needs of prospective customers cannot be filled—not, however, because of lack of desire on our part; but rather because the needs of the emergency must be met first.

We serve you now by serving national defense! When our job of war is done, we'll welcome the opportunity of solving your forgings problems!

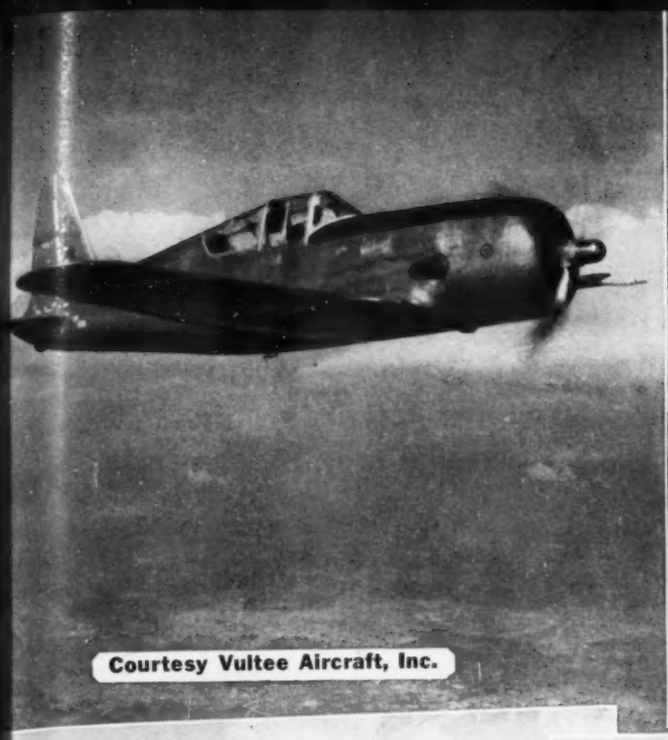
KROPP FORGE COMPANY

World's Largest Job Forging Shop

5301 West Roosevelt Road, Chicago, Illinois

Representatives in Principal Cities

The United States Bureau of Ordnance Flag and Navy "E" Pennant for Excellence, rarely awarded material suppliers, fly high at our plant. We are proud of this recognition of our efforts.



Courtesy Vultee Aircraft, Inc.

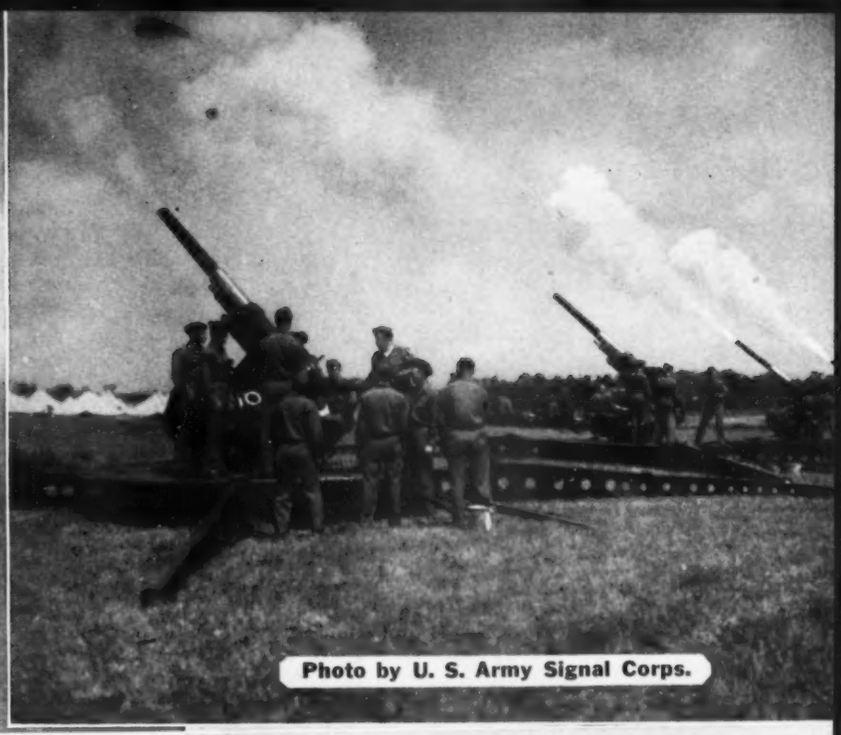
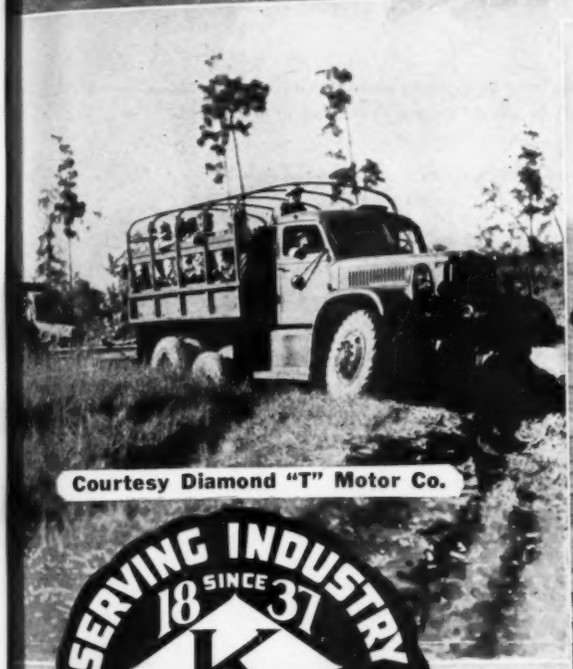


Photo by U. S. Army Signal Corps.



Courtesy Diamond "T" Motor Co.

Official U. S. Navy Photograph

SERVING INDUSTRY
18 SINCE 37
K
KROPP
FORGE
CO.
OVER 100 YEARS

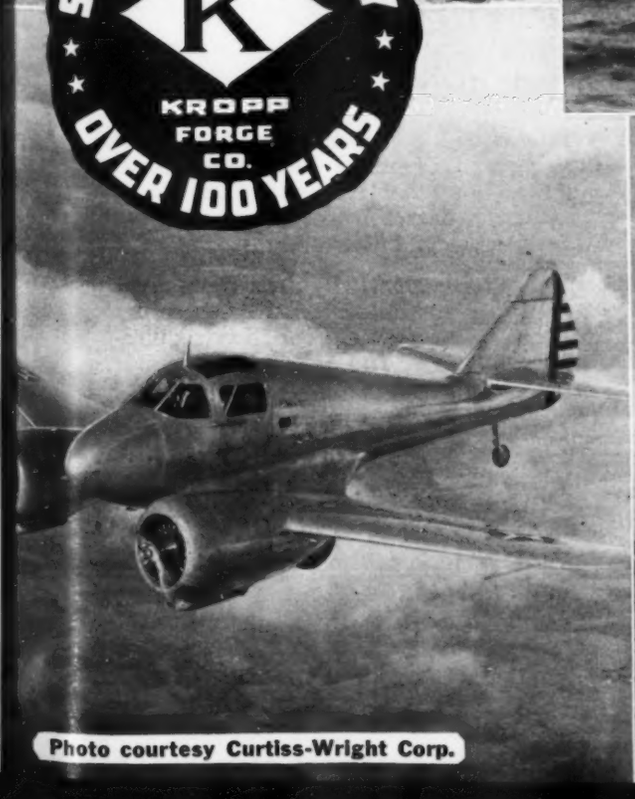
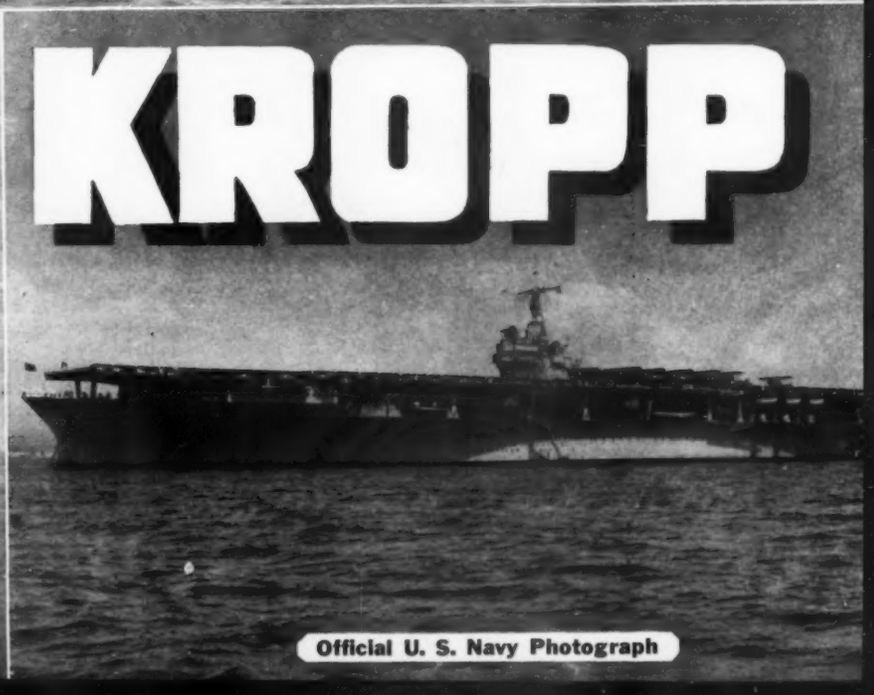


Photo courtesy Curtiss-Wright Corp.

KROPP



Official U. S. Navy Photograph

TUFFERNELL

IS THE

RIGHT WORD FOR THE

RADIO-FREQUENCY

TESTED INSULATION IN

WESTINGHOUSE

CS MOTORS

—IT'S JUST ONE OF

THE FEATURES THAT

KEEP 'EM

YEARS

AHEAD!

J-21239

WESTINGHOUSE

See Page 48

And Page 49

6

jobs where airplane and accessory manufacturers can

SAVE TIME

by degreasing or cleaning parts the fast Oakite way:

1. Degreasing or cleaning aluminum alloy structures and assemblies before anodizing or other protective surface treatment.
2. Speeding operation of preparing aluminum surfaces for resistance spot welding.
3. Removing excess flux from soldered aluminum and copper parts.
4. Speedily removing protective oil coating from aluminum sheets and plates before various fabricating operations.
5. Removing heat treat film from aluminum parts.
6. Cleaning planes after test flights.

On these 6 jobs and many others, leading aircraft and accessory plants are successfully SAVING TIME . . . SPEEDING UP production and INCREASING output. Let us do the same for you! Name the operation or problem . . . find out how NEW, specialized Oakite materials meet exacting requirements for degreasing or cleaning war products on the basis of speed, thoroughness, economy and safety.

WAR-TIME OAKITE SERVICE FREE

All our facilities . . . our Nation-Wide Field Staff, our Engineering and Chemical Research Laboratories . . . are freely available to render service on any war production degreasing or cleaning operation you want performed better and faster.

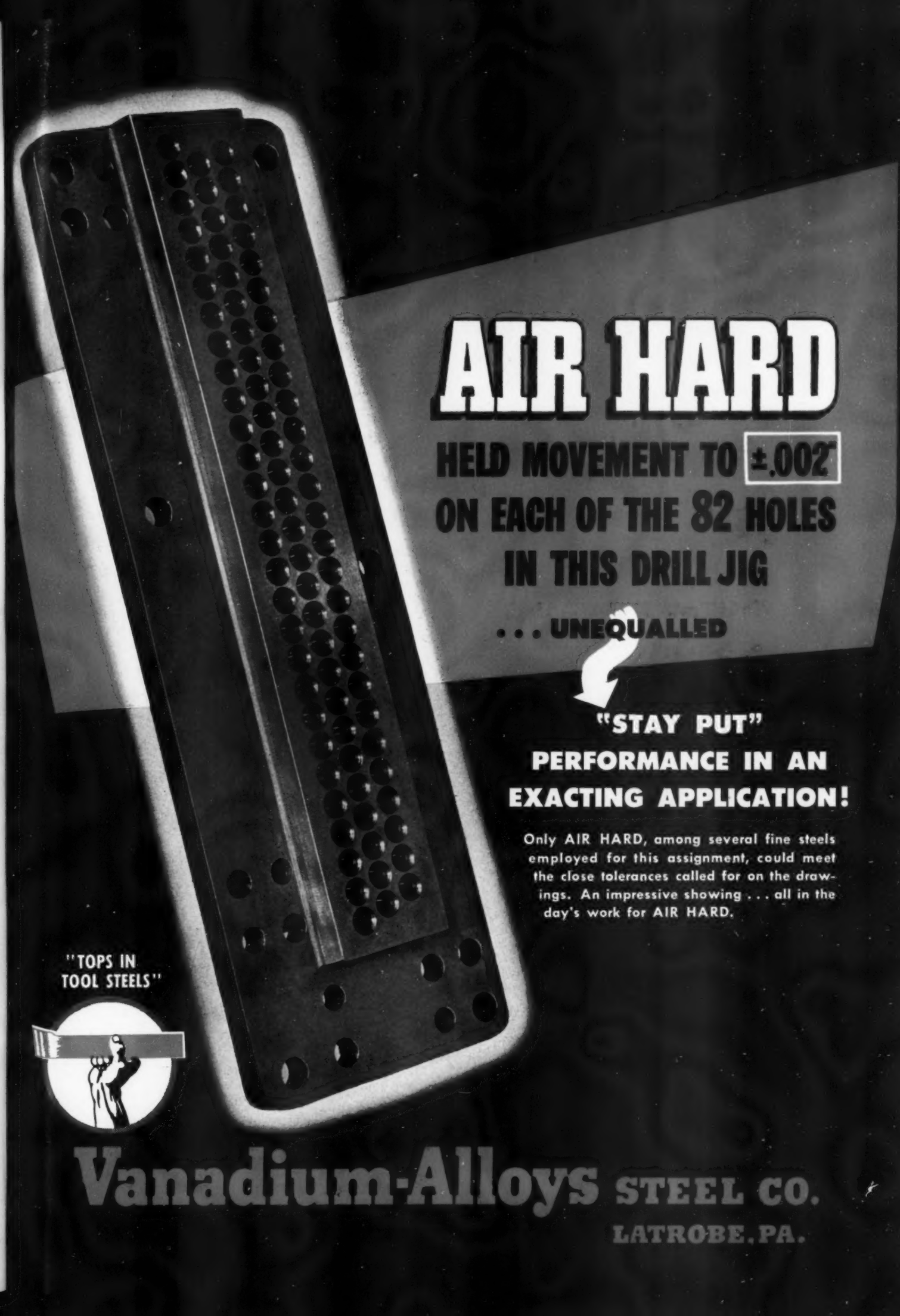
Remember, too, conveniently located warehouse stocks of over 60 different Oakite materials assure prompt delivery to meet any production requirement. Inquiries invited . . . no obligation.

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.

Representatives in All Principal Cities of the U. S. and Canada

OAKITE *Specialized* CLEANING

MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT


AIR HARD
HELD MOVEMENT TO ±.002"
ON EACH OF THE 82 HOLES
IN THIS DRILL JIG
. . . UNEQUALLED
"STAY PUT"
PERFORMANCE IN AN
EXACTING APPLICATION!
Only AIR HARD, among several fine steels employed for this assignment, could meet the close tolerances called for on the drawings. An impressive showing . . . all in the day's work for AIR HARD.
"TOPS IN TOOL STEELS"
Vanadium-Alloys STEEL CO.
LATROBE, PA.

. . . *give all your workers AO Goggles*

Eye injuries that take men off jobs, even for a little while, deprive our armed forces of invaluable equipment. *In 1941, more than 9,000,000 man-days were lost by eye accidents alone.*

Don't let eye accidents occur in *your* plant. American Optical Company offers you comfortable safety goggles for every type of industrial eye hazard . . . the services of trained safety representatives . . . a practical plan for intelligent eye protection . . . and material to help you carry out the plan. Call your AO Branch Office today for information and help.

THE American Optical COMPANY
SOUTHBRIDGE MASSACHUSETTS

HASTENING

THE MANUFACTURE OF BROWN & SHARPE MAGNETIC CHUCKS

- - to give Industry the *many* advantages of our Permanent Magnet Type

FIVE RECTANGULAR MODELS – 2½" x 5" to 12" x 36"

ROTARY MODEL – 9" Diameter

- NO WIRES
- NO HEATING
- NO OPERATING COST

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.

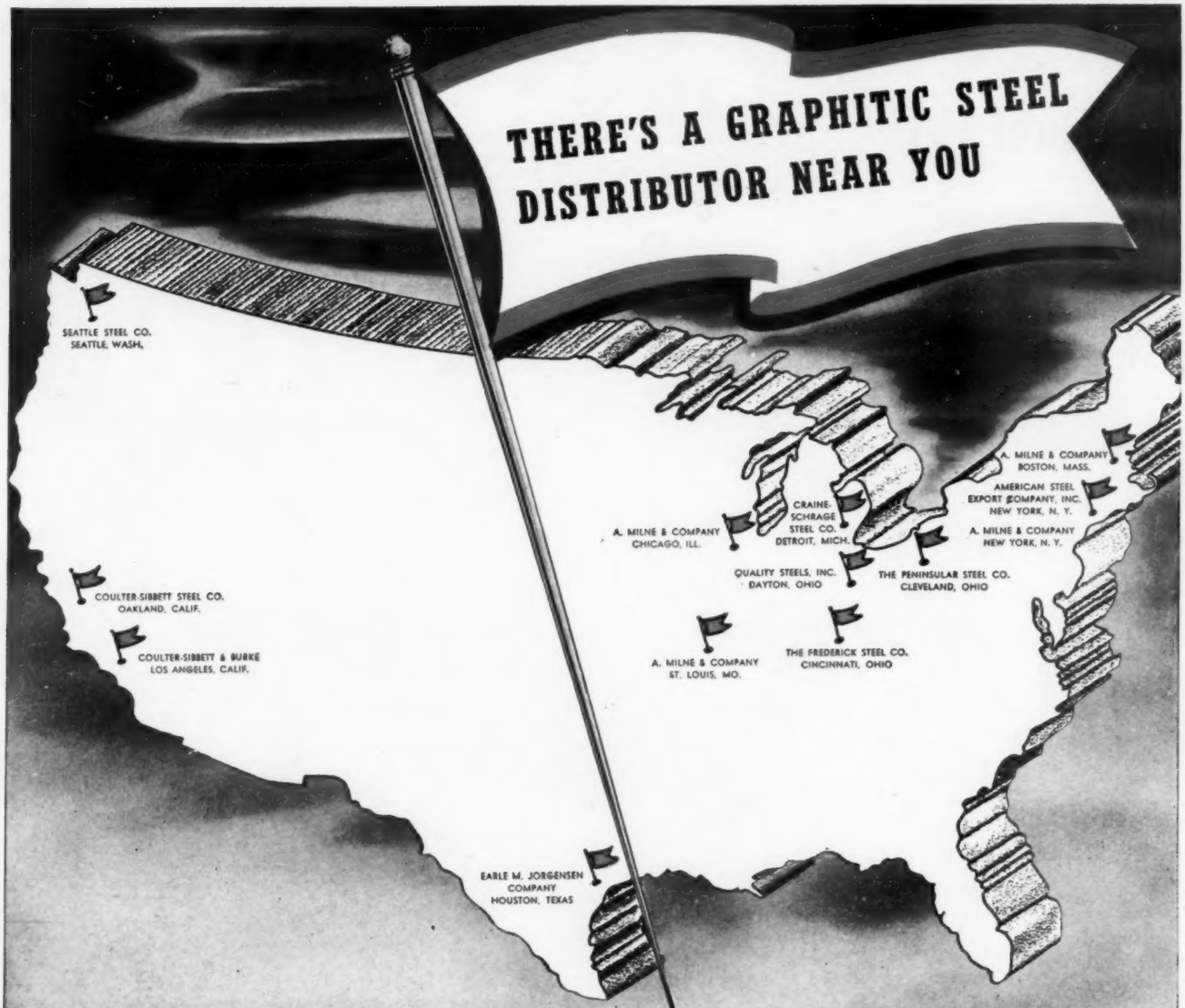
Brown & Sharpe Mfg. Co. Providence, R. I., U. S. A.

B·S

B·S Brown & Sharpe Mfg. Co., Providence, R. I., U. S.

For sale only in the U. S. A. and its Territories

BROWN & SHARPE



Have you been wondering where you can buy America's fastest machining, longest wearing tool and die steel—Graphitic Steel?

There's a Graphitic Steel distributor near you. Ask him for more information or place an order today. He carries a stock of all five grades of Graphitic Steel—Graph-Al, Graph-Sil, Graph-Tung, Graph-Mo, and Graph-M.N.S.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division.

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

The phenomenal popularity of Graphitic Steel is based solely on its superior machining qualities and endurance. It will be popular in tough post-war competition for these same reasons.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

A Compact Streamlined BENCH-TYPE Drill Grinder

—a genuine SELLERS grinder

HERE is a small, practical, bench-type drill grinder that embodies the basic principles and the inherent accuracy of the Sellers chuck and the Sellers method of drill grinding. This self-contained machine produces the famous Sellers drill point on one or a million drills in sizes as small as .028" (#70) and up to ½" diameter. It provides drill lips ground with the same inclination to the drill's axis, of equal length and with proper clearance at both center and periphery—the secret of the efficiency of the Sellers drill point.

Pedestal Cabinet for 1-G Drill Grinder

Write for Bulletin on Sellers 1-G Drill Grinder

WILLIAM SELLERS & CO., INCORPORATED
1600 Hamilton Street Philadelphia, Pa.

MODEL 1-G

FOUNDED SELLERS 1848

Sellers

Wood models today... gearmotors tomorrow

Quieter, more efficient slow-speed drives don't just happen. Improved performance is engineered—by constant, unremitting research and experiment.

Westinghouse engineers have been on this job since 1887. And today they are still working with tests and models like the ones shown above for more efficient methods of mounting, more adaptable design, and even quieter operation.

Westinghouse continues to find better answers because it attacks the problem as a whole. Westinghouse Gearmotors are designed, built and tested as complete units. Because of efficient gear-cutting processes and careful matching of motors and gears, Westinghouse is able to provide slow output speeds with efficiency as high as 98%.

Specify a Westinghouse Gearmotor for every type of slow-speed drive, whether single, double, or triple reduction or with special enclosures. For the up-to-the-minute answer to your slow-speed drive problems, see your Westinghouse representative. Or write Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Department 7-N.

J-07191-A

STANDARD A.G.M.A. OUTPUT SPEEDS

STANDARD OUTPUT SPEEDS for concentric and parallel shaft integral hp Gearmotors. Based on 1750, 1430 or 1165 rpm motor operating speeds.

1430	190	25
1170	155	20
950	125	16.5
780	100	13.5
640	84	11.0
520	68	9.0
420	56	7.5
350	45	6.0
280	37	5.0
230	30	4.0

AGMA

Westinghouse

GEARMOTORS

UNCONSCIOUS waste in this land of plenty can become a serious handicap in our war effort. Let's take a case in point — oxygen. This element is vital to the speedy production of tanks, trucks, guns, ships, planes, and shells.

Oxygen consumption continues to skyrocket and the bottleneck remains steel cylinders. They just can't be obtained fast enough. But, we can all help by making every cylinder most useful. Here's how:

Make yourself a Waste Warden. See that the cylinders keep rolling. Don't let them get tied up in inventory. Be sure that cylinders are shipped back promptly when they are empty — and be sure to get the most gas out of each cylinder. If you see to it that these and other "do" and "don't" suggestions are followed you will be making a worthwhile contribution to our war effort as well as helping yourself.

Join the "Waste Wardens". Keep the cylinders rolling.

WASTE WARDEN SAYS:

DO close cylinder valve after use.
DO check your hose and connections for leaks.
DO keep inventory low.
DO return empty cylinders promptly.
DO keep tips clean and free from carbon and slag.

DON'T use excessive pressure.
DON'T use oversize tip.
DON'T leave tip burning when not in use.
DON'T abuse cylinders.
DON'T leave cylinder valves open when gas is not being used.

Air Reduction

60 EAST 42nd ST., NEW YORK, N. Y.

IN TEXAS: MAGNOLIA-AIRCO GAS PRODUCTS CO.

AIRCO

WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

Tool life greatly increased by reconditioning cutting oil *with*

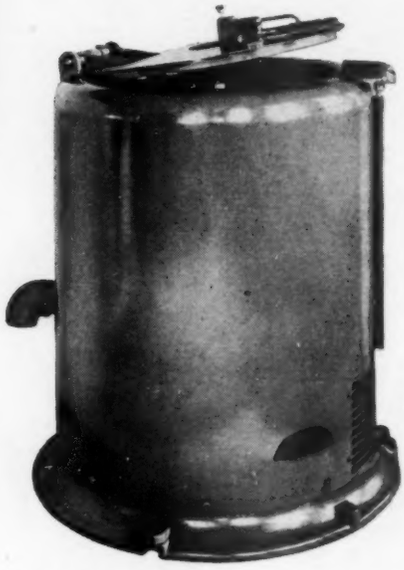
BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

The Barrett Centrifugal Oil Extractor—which is part of a complete system—recovers 100% of the removable oil or 98½% of the contained oil from chips and turnings in 2 minutes or less. Complete Barrett oil recovery and reconditioning systems include Extraction, Sterilization and Sedimentation, together with filtration. The units involved are available in various sizes, individually or as a group, and are available with full manual control, semi-automatic control or with full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plants including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems



Barrett Centrifugal Oil Extractor — the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT CO., WORCESTER, MASS.

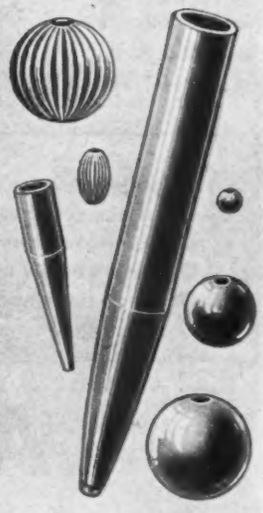
Designers and Builders of Centrifugal Machinery

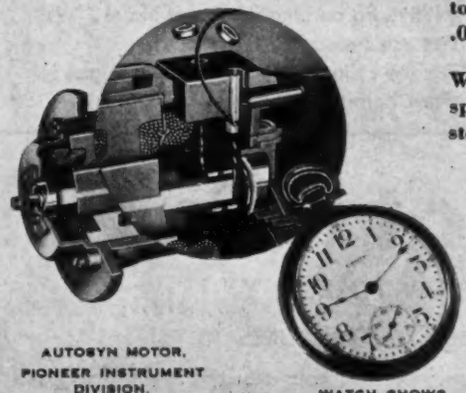
MAKEPEACE FACILITIES

can speed your own production

THE little Pioneer Autosyn Motor, we illustrate, is fitted with Makepeace Contact Rings which have to be made to extremely close specifications and must never fail because the pilot of a bomber depends upon this tiny motor to tell him whether all is well with the vital parts of his plane.

We specialize in such small parts and our long experience in supplying the optical and jewelry trades with sheet, wire and tubing and pen and pencil manufacturers with caps, tapers and shells, fit us admirably, in these times of emergency, to undertake the production of similar articles. Our equipment is available to roll sheet and draw tubing in any non-ferrous metals. We do not mean the standard sizes of the brass mills, but wherever close tolerances and speed of delivery are required. We can hold sheet and wire, in most metals, to plus or minus .0001 and tubing to plus or minus .00015 in small gauges.





AUTOSYN MOTOR, PIONEER INSTRUMENT DIVISION, BENDIX AVIATION CORP.

WATCH SHOWS RELATIVE SIZE

We carry small stocks which can be finished to close specifications on Priority or we will refinish your own stock to specifications, trim tubing or cup and form any non-ferrous metal in quantity.

Let us show you how we can help speed your production by doing some of this work for you.

D. E. MAKEPEACE COMPANY

ATTLEBORO, MASS.

. . . with heads up!

Staunch and sincere is the handclasp between Wyckoff and the Navy. Proud and sincere are the Wyckoff workmanship and efficiency that won the Navy's highest symbol of recognition, the All-Navy "E" Burgee . . . which keep every Wyckoff workman's head up . . . and which continue to break all previous production records month after month. We are answering the call for Victory Production with speed and enthusiasm twenty-four hours every day!

WYCKOFF DRAWN STEEL COMPANY

FIRST NATIONAL BANK BLDG., PITTSBURGH, PA. - 3200 SO. KEDZIE AVENUE, CHICAGO, ILL.

Mills at Ambridge, Pa. and Chicago, Ill. - Warehouses in Principal Cities

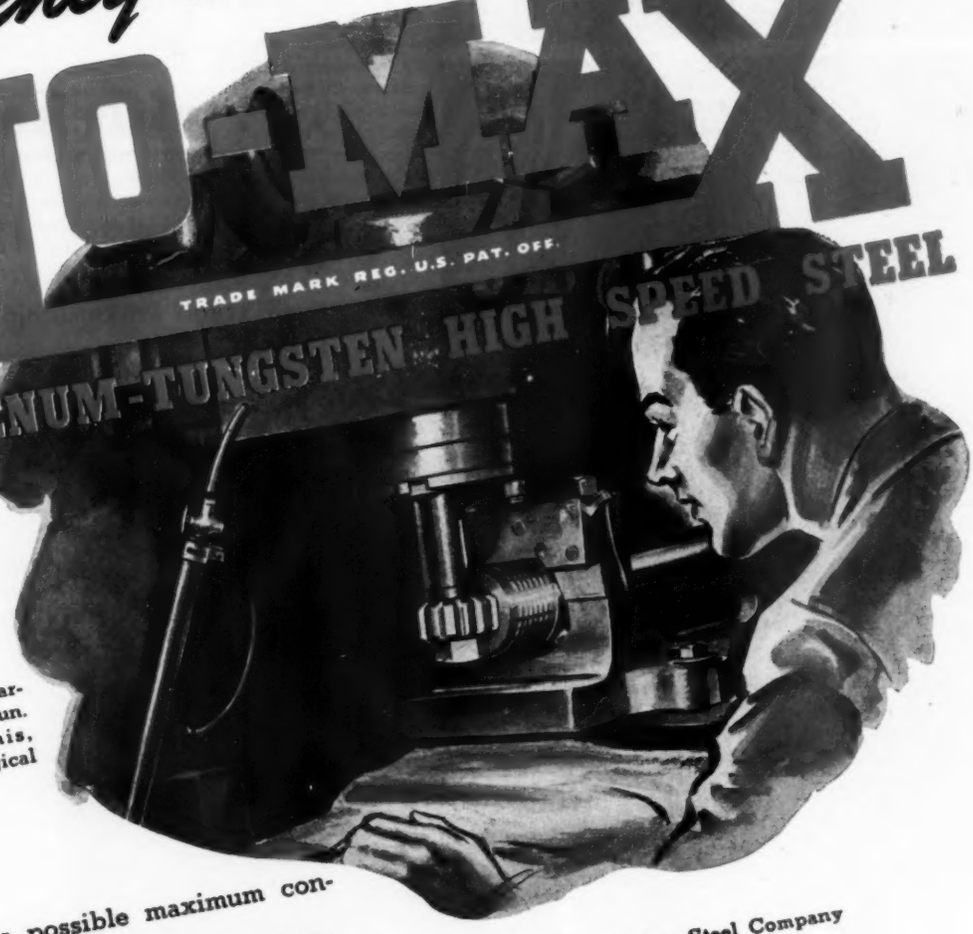
Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting
Turned and Ground Shafting . . . Wide Flats up to 12" x 2"

PRODUCE STILL MORE
get 20% greater tool efficiency with

MO-MAX

TRADE MARK REG. U.S. PAT. OFF.

MOLYBDENUM-TUNGSTEN HIGH SPEED STEEL



Milling cartridge clearance slot in machine gun. On jobs such as this, MO-MAX is the logical choice.

MO-MAX makes possible maximum conservation of vital alloys.

1 It contains *less than two percent of tungsten.* This amount is being produced in this country or is available from existing high speed steel scrap.

2 It contains only *one percent* of vanadium—a critical alloy.

3 Molybdenum is produced in large quantities within our borders.

4 A chromium content of 3.50 to 4.00% is satisfactory—thus a minimum of chromium is required.

5 MO-MAX has a nine-year record of proved performance, and can be obtained from fourteen leading steel manufacturers.

For Technical Data Booklet!

Write any of the steel makers listed or to The Cleveland Twist Drill Co., Cleveland, Ohio.

LMW . . . Alleghany Ludlum Steel Company
MOHICAN . . . Atlas Steels, Ltd.
BETHLEHEM HM . . . Bethlehem Steel Company
MO-CUT . . . Braeburn Alloy Steel Corporation
STAR MAX . . . Carpenter Steel Company
MOLITE 8 . . . Columbia Tool Steel Company
REX TMO . . . Crucible Steel Company of America
DI-MOL . . . Henry Disston & Sons, Inc.
REX TMO . . . Halcomb Steel Division Crucible Steel Company of America
MOGUL . . . Jessop Steel Company
TATMO . . . Latrobe Electric Steel Company
S.T.M. . . . Simonds Saw and Steel Company
MO-TUNG . . . Universal-Cyclops Steel Corporation
VUL-MO . . . Vulcan Crucible Steel Company

This advertisement also appeared in:
NEW YORK TIMES
CLEVELAND PLAIN DEALER
CHICAGO DAILY NEWS
DETROIT FREE PRESS
WASHINGTON POST

You Expected to Read This NEXT YEAR!

Industry after industry is beating its promise as America's war production sets new world's records . . . Management, labor, W. P. B., Army, Navy, the Maritime Commission and other government departments are cooperating to make next year's headlines come true THIS year.

In World War I, the Kaiser feared American manpower. In World War II, Hitler is even more fearful of our rapid transition from peace to war production. . . . He has reason to be afraid.

Printing press factories are exceeding quotas on anti-aircraft gun parts.

Spark plug manufacturers are setting new speed records in machine gun production.

The heavy-transportation industry is making giant chassis for big guns at a faster rate than all the Axis powers combined.

In this industry, men who used to make locomotives and tractors are changing "Too Little and too Late" to read "Too Much and too Soon," from the enemy's viewpoint.

Starting just a few months ago, with a bale of blueprints and a knowledge of how to build such things as road-scrapers, power-shovels and trucks, the heavy-transportation industry is turning out mobile artillery that will shake the earth in more than a literal sense.

• • •

The story of how this industry joined the army carries a significance which should be understood and remembered.

The significance is that America has solved the problem of exchanging production techniques between specialized industries. This process went on unnoticed in peacetime. War gave it prominence.

OVER

▶When the bales of blueprints were first delivered, and the heavy-transportation industry started on its job of producing prime-movers and chassis for big guns in quantity, new production techniques were needed in a hurry.

▶Here are some of the questions that arose:

"How do you weld such heavy sub-assemblies?"

"What welding fixtures will handle these parts so that our workmen can always weld down-hand?"

"How can we make these long, heavy welds and have sound metal from one end to the other?"

"What's the best technique for testing welded parts? Shall we x-ray, or use the magnaflux process?"

"What's the best way to support these welded assemblies for machining?"

That's just a few of the thousands of questions that arose in the minds of experienced men when they had to solve new problems.

They illustrate the fact that American production methods depend upon specialized techniques and machines.

Each man with such a problem knew that someone, somewhere, had solved his problem, or might solve it before he could work out his own answer.

Therefore he turned to the source of industrial information he had always used when he wanted to know what others were doing . . . his industrial magazine.

Ever since the Maginot Line was flanked, the Industrial Press of America has been helping rookie industries to become veterans in the battle of war production.

▶It doesn't do this by exhortation or command, but by answering thousands of specific questions.

Just as newspapers keep their war correspondents at the front, Industrial Magazines keep their "war-production-correspondents" in the plants where weapons and equipment are made. McGraw-Hill editors are mobilized for war as literally as though they were firing weapons instead of helping to produce them. More than 90% of the time of McGraw-Hill's 153 editors and 725 engineer-correspondents is devoted either to visiting war-production plants (to study production techniques) or in writing "war stories" on how production problems were solved.

"Know-how" is the secret of the amazing records now being made by American Industry. And "know-how" comes from thousands of "little facts" like this:

Information on tool shapes for cutting the harder steels of war is vital literature to the engineer, designer or production man with the particular problem of cutting those steels confronting him.

The industrial editor does not work alone in giving vital information to men on the production line. In much the same way, manufacturers are war-converting their industrial advertising to show their readers how to use their products more effectively. For instance:

A business-paper advertisement showing how to make old taps and dies last longer has no glamour for anyone but the man who must rush production with an inadequate supply of new ones. To him it has enough "oomph" to be clipped and placed on his office wall.

To the casual observer, the Industrial Press is about as exciting as the rows of wires that stretch along every road and railway. . . . The simile is very apt. Both exist solely for the interchange of ideas. Both are typically American in the extent to which they have been developed and applied to the whole economy. . . . *This advertisement published by the McGraw-Hill Network of Industrial Communication.*

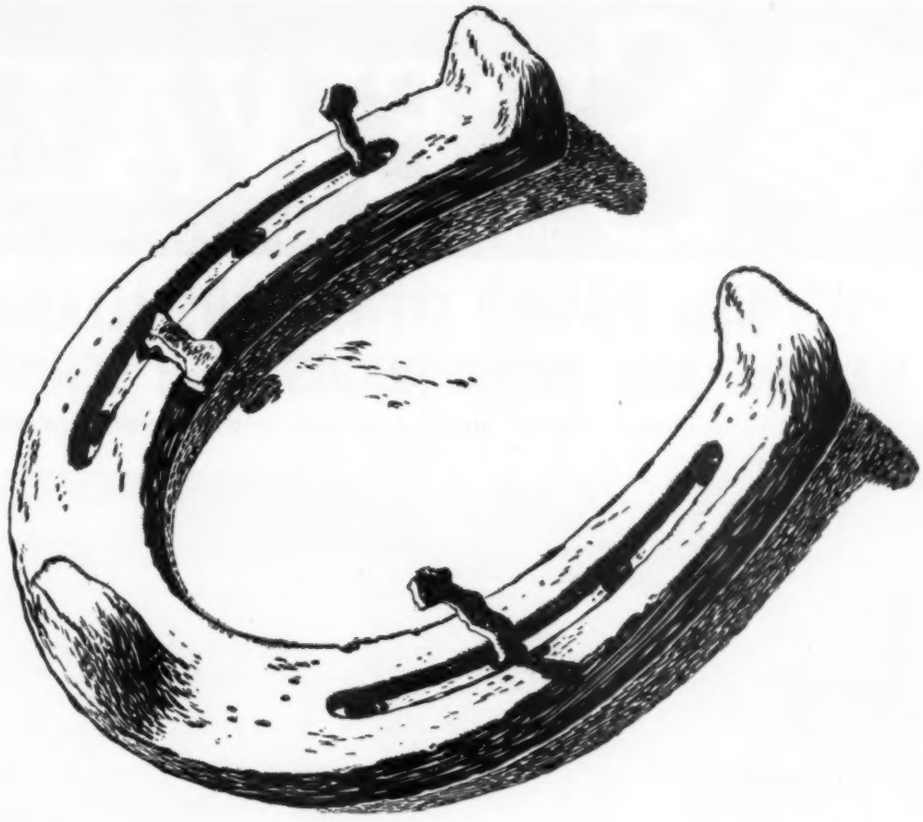
• • •

THE McGRAW-HILL NETWORK

23 PUBLICATIONS WHICH HELP MORE THAN 1,000,000 EXECUTIVES, DESIGNERS AND PRODUCTION MEN TO EXCHANGE IDEAS ON WAR-PRODUCTION PROBLEMS

American Machinist • Aviation • Bus Transportation • Business Week • Chemical & Metallurgical Engineering • Coal Age • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets • Engineering News Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Transit Journal • Wholesaler's Salesman. Also publishers of thousands of books for technical and engineering schools and colleges, as well as for general business use.

McGRAW-HILL PUBLISHING COMPANY, INC.
330 WEST 42nd STREET, NEW YORK



LUCK helps...

but you can't run a business on it

The man who always "gets the breaks" isn't lucky, he's progressive. He makes his own luck because he has the initiative to try new ideas, new methods. He realizes today's production winner can be an also-ran tomorrow. The Shell man talks his language.

That's why purchasing and production executives go out of their way to pump our men for new ideas. They have found Shell men to be more than mere sellers of oils and greases.

Have you talked to a Shell man lately about balanced lubrication? **He may be able to help you, as he has others, to increased production, longer machine and tool life, improved finish.**

SHELL LATA OILS *for Cutting*

SHELL

No. 35 OF A SERIES of Typical Installations

STEWART

THE BEST INDUSTRIAL FURNACES MADE

NEW 75-UNIT STEWART INSTALLATION AT THE MACHINE AND METAL TRADES HIGH SCHOOL, NEW YORK

Typical of the Stewart furnaces that are providing the basic vocational training so much in demand by war industries

Large illustration shows 4 Stewart Triple-combination furnaces, 12 Stewart Bench Oven furnaces, 1 Stewart double-deck high speed steel pre-heat and high-heat furnace, 2 Stewart semi-muffle oven type furnaces, 3 Stewart direct-fired forge furnaces. Small illustration at right shows 6 Stewart semi-muffle oven furnaces with other standard Stewart units in background.

With the metalworking industries all-out in their war production effort, the need for men with practical training in heat treating is now more acute than ever.

Literally thousands of standard Stewart furnaces are in the Vocational departments of technical schools and colleges. Because these Stewart units have been designed for efficient production heat treating in small shops and tool rooms, they are recognized as standard equipment for all types of industrial heat treating and vocational training work.

The 75-unit Stewart installation at the Machine and Metal Trades High School, New York, is one of the newest and largest of its kind in the U. S. There are furnaces for carbon-steel, high speed steel, cyanide, lead hardening and tempering work, forging and bending, brazing, metal melting, tool room and general production heat treating, as well as experimental work of all kinds.

In addition to the famous line of standard furnaces, Stewart engineers design and build oil or gas-fired heavy duty furnaces, car, pusher or conveyor types, plate heating, shape and angle heating, shell nosing, shell and shot heat treating, and rotary hearth shell forging furnaces.

A letter, wire or 'phone call will promptly bring you information and details on standard or special Stewart furnaces suitable for your requirements. Or if you prefer, a Stewart engineer will be glad to call and discuss your heat treating problems with you.

STEWART INDUSTRIAL FURNACE DIVISION of CHICAGO FLEXIBLE SHAFT CO.

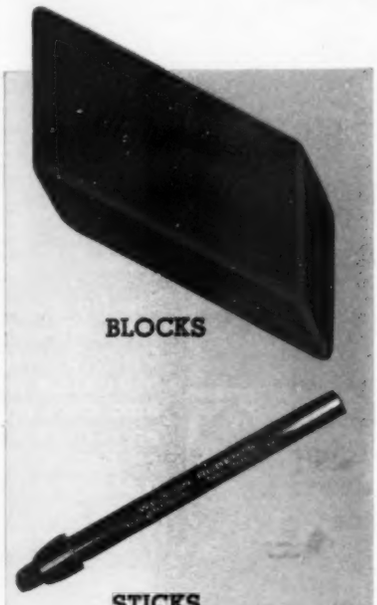
MAIN OFFICE:
5600 W. Roosevelt Rd.
Chicago, Ill.

CANADA FACTORY:
(FLEXIBLE SHAFT CO. LTD.)
321 Weston Rd., So.
Toronto

FROM A 25 TON CAR-TYPE ... TO A 6 INCH POT

Developed and Proved as a War Industry "MUST"

Brightboy



TIME AND WORK SAVINGS

★ ***Speed up*** **FINISHING, DE-BURRING, POLISHING, PRE-POLISHING;**

★ ***Remove*** **DIGS, TOOL AND HEAT MARKS;**

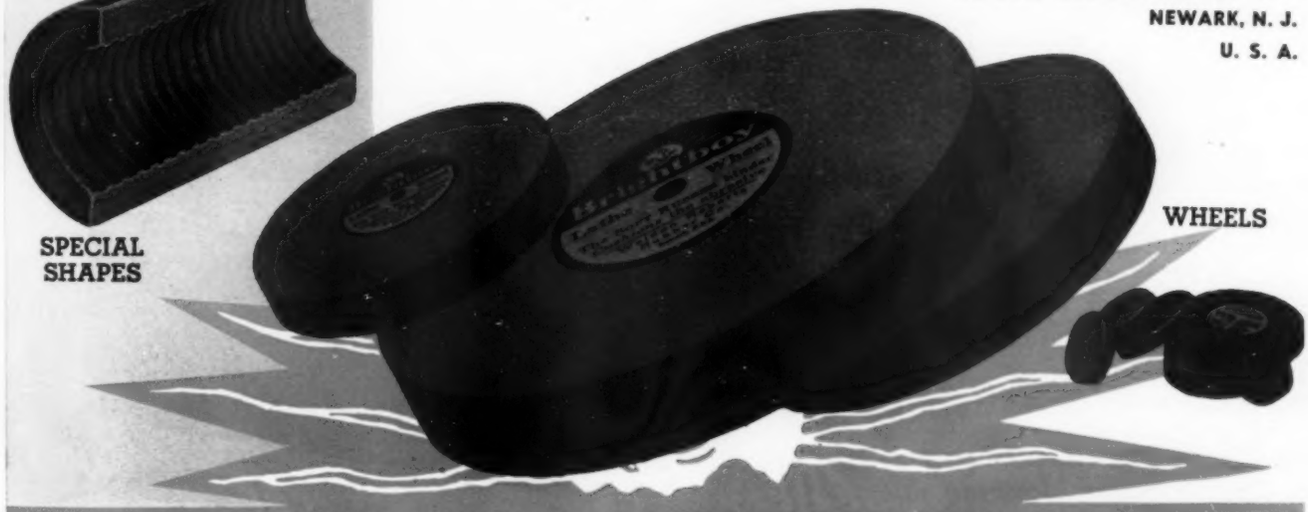
★ ***Smooth*** **WELDED AND SOLDERED JOINTS, LIGHT STAMPINGS, DIES**

THE abrasive is "cushioned" right into the rubber. Takes over the job where emerys and grinders leave off. Not a grind. Not a buff. A new finishing method producing a precision job with a minimum dimensional loss of material.

Ready for *immediate* use. No time-taking preparations. Easy to use by *any* employee. No special training necessary. Every bit of the material is usable. Made in blocks, sticks, tablets and rods for handwork; in wheels (which deburr, polish, and put on a slight radius in one operation) for use on portable and stationary power machinery—lathes, grinders, polishers and other automatic and semi-automatic machines. Now saving precious time in outstanding war industries. New uses being discovered daily.

Available to war industries through recognized mill supply dealers. Write us direct for catalogs and prices if your dealer cannot supply you.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
NEWARK, N. J.
U. S. A.



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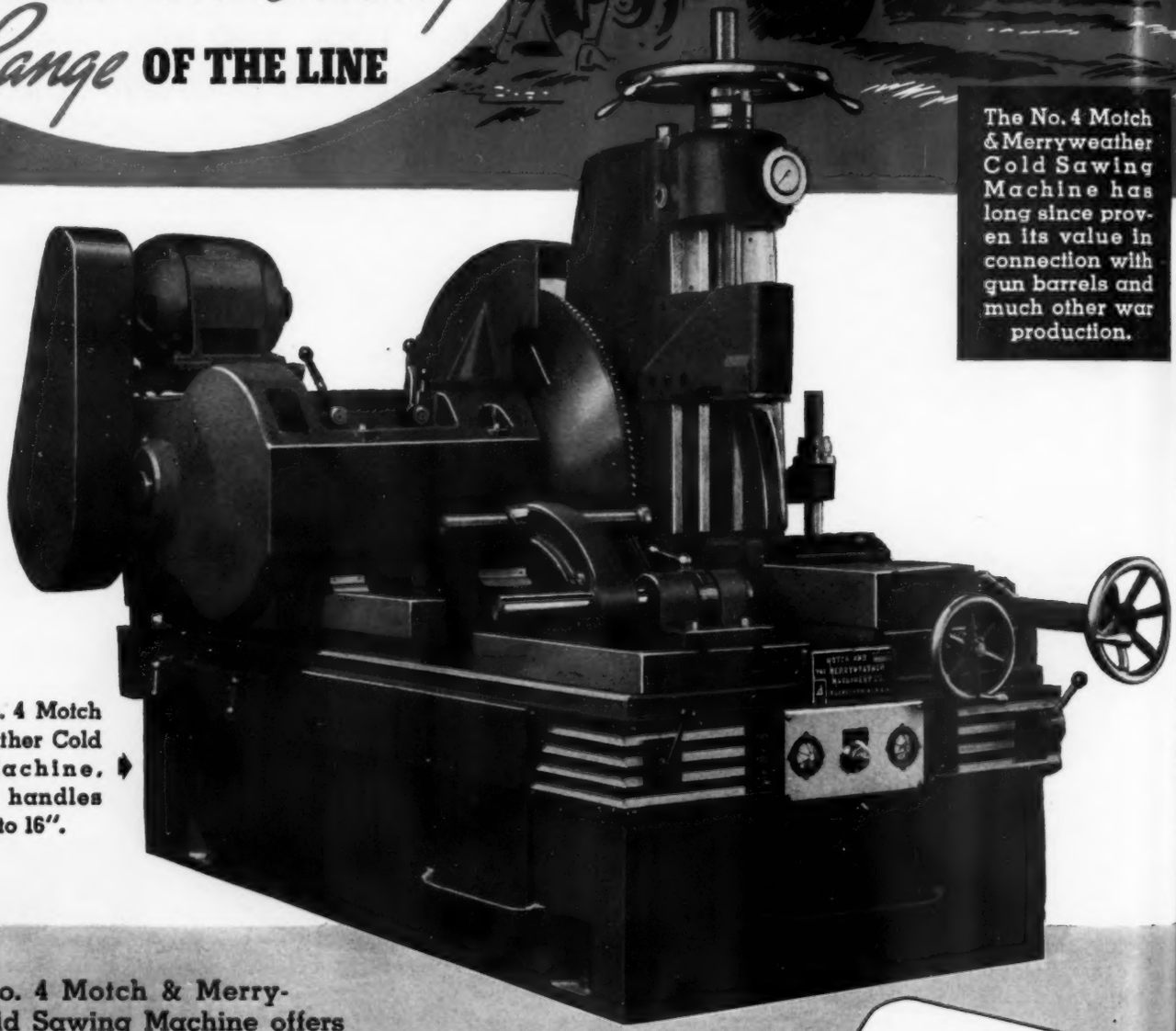
THE No. 4
MOTCH & MERRYWEATHER
COLD SAWING MACHINE
Extends the Cutting Range OF THE LINE

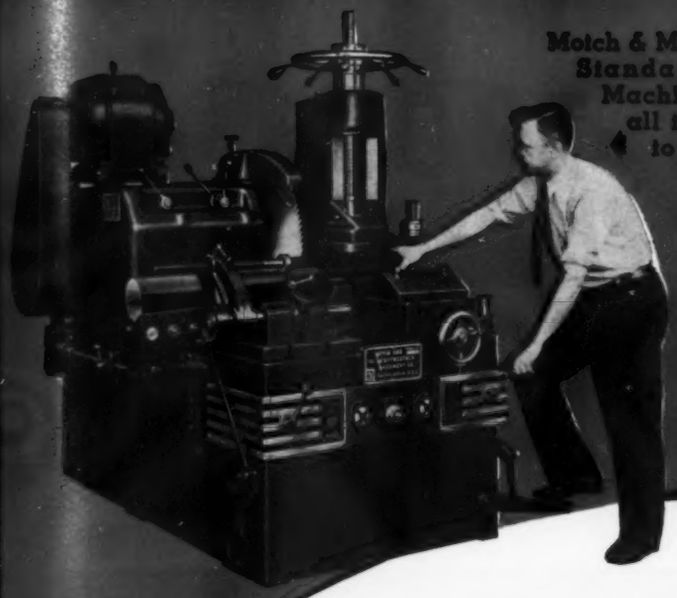
The No. 4 Motch & Merryweather Cold Sawing Machine has long since proven its value in connection with gun barrels and much other war production.



The new No. 4 Motch & Merryweather Cold Sawing Machine, shown here, handles stock up to 16".

The new No. 4 Motch & Merryweather Cold Sawing Machine offers you the same advantages as are to be had in the No. 3 machine. You get the same clean, square sections without burr; the same elimination of scrap; the same operating convenience that saves the man's energy; the same rigidity and accuracy without vibration or chatter; the same multiple-cutting ability without slippage; the same stamina, permitting continuous operation seven days a week, and new top cutting speeds which run up to 1½ times as high as were ever attained before . . . With the development of the Motch & Merryweather Cold Sawing Combination, another important operation has passed into the category of jobs well done. *Only Motch & Merryweather builds saw, blade and grinder.* Any ensemble is better if all the components are designed, constructed and correlated by *one* organization.

Only M+M builds
ALL 3
COLD SAW
SAW BLADE
SAW GRINDER

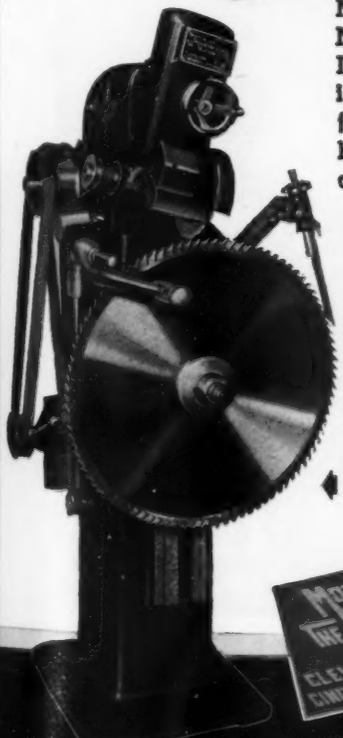


Motch & Merryweather No. 3 Standard Cold Sawing Machine, for steel and all types of metal up to its capacity.

Motch & Merryweather No. 3 High Speed Cold Sawing Machine for non-ferrous metals, with saw blade speeds from 98 to 724 feet per minute.

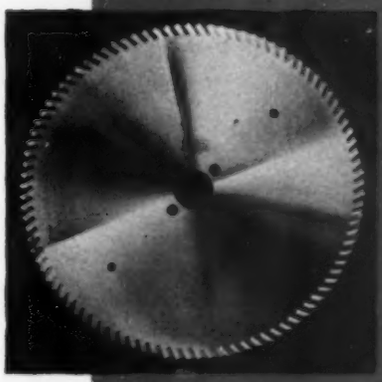
The No. 3 Motch & Merryweather Cold Sawing Machine is available in both standard and high speed models. These machines handle square stock up to 9⅝" and round stock up to 10⅝". Both can be supplied with a wide range of attachments.

Motch & Merryweather No. 3 Double Clamp Cold Sawing Machine, adjustable for rounds up to 9⅝" and squares up to 6⅜".



Motch & Merryweather No. 3 Non-adjustable Double Clamp Cold Sawing Machine, arranged for single size bars. Filler blocks, however, lend a degree of adjustment.

The Motch & Merryweather Automatic Saw Grinder has great speed, gives accurate pitch, and delivers the right tooth contour, thus lengthening intervals between grinds.



Motch & Merryweather's many years' experience has perfected segmental saw blades which are unrivalled in material, design, fit, workmanship, cutting speed and length of service.

THE MOTCH & MERRYWEATHER MACHINERY CO.

PENTON BUILDING • • CLEVELAND, OHIO

MOTCH AND MERRYWEATHER MACHINERY Co
CLEVELAND CINCINNATI DETROIT PITTSBURGH

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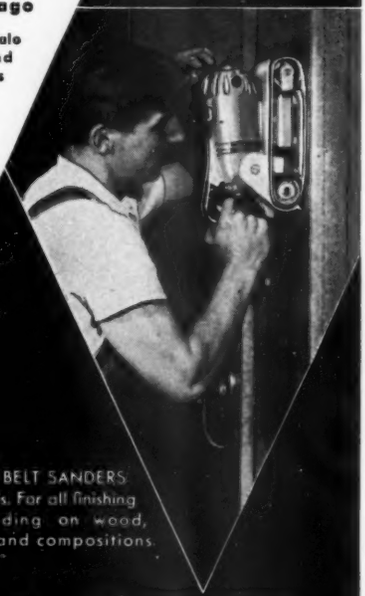

• SKILSAW BELT SANDERS—4 Models. For all finishing and sanding on wood, metals and compositions.

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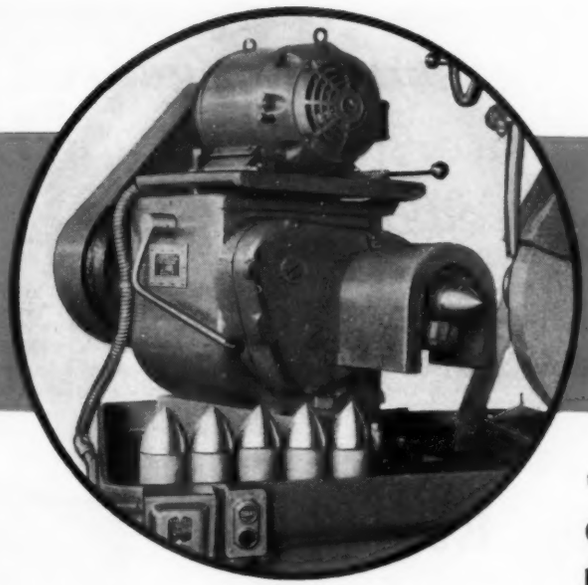
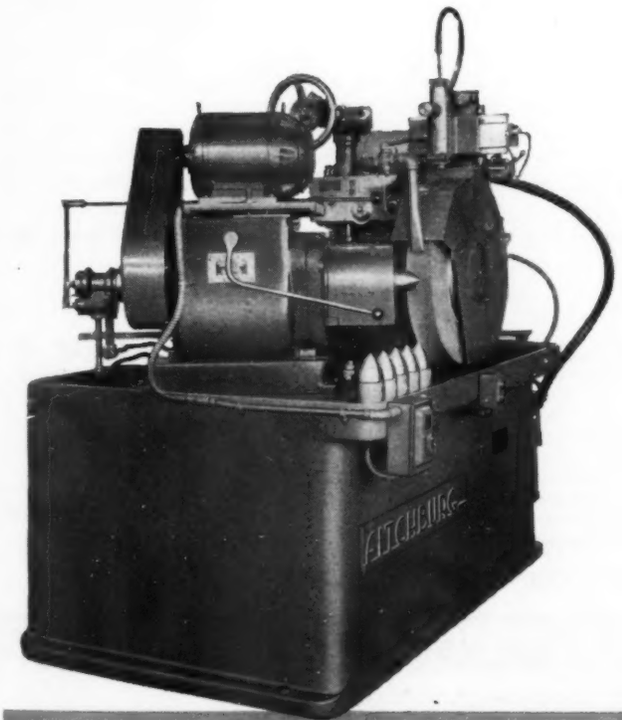
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★



on Grinding jobs like this

. . . FITCHBURG OFFERS SPECIAL ADVANTAGES IN MASS PRODUCTION

This Fitchburg special Chucking Grinder with a heavy duty headstock, is designed for grinding the ojive of armour piercing shells. The wheelhead is a Fitchburg Standard Bowgage Unit carrying a 24" x 3½" face wheel. A hydraulic form trueing device is mounted on the wheelhead.



To operate this machine the operator places the shell in the open jaw chuck, then, by pushing a ball lever forward, closes the chuck, clamping the work piece at a definite distance from the bottom of the shell. To start the work rotation, operator depresses the long lever and pushes the button to start the automatic grinding cycle.

When installing special precision grinding equipment, it is well to remember that the Fitchburg Bowgage Grinding Wheelhead is a standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

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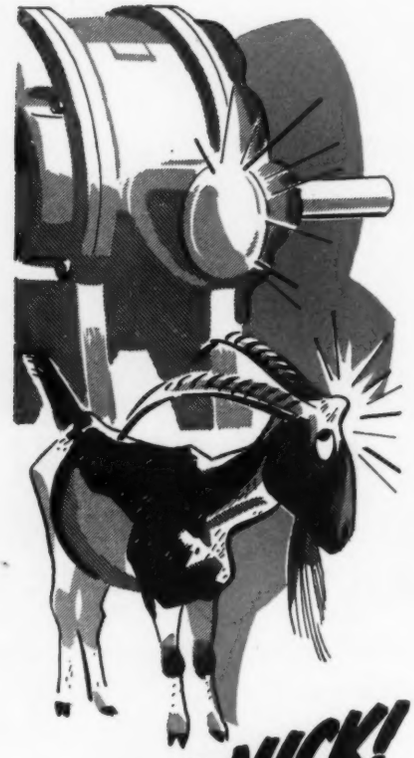
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.



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THEY'RE YEARS AHEAD WITH RIGID-ONE-PIECE FRAMES THAT PROTECT INTERNAL PARTS LIKE A SAFE!

J-21237

WESTINGHOUSE

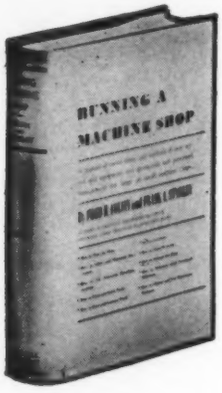
SEE PAGE 48 AND PAGE 49

Is your shop geared for emergency production needs?

How about *management?* Have you taken every means of improving your shop layout and handling of tools, work, records, men, etc., so as to eliminate bottlenecks and put through the greatest amount of profitable work in the busy days ahead? Here's a great new book by the famous machine-shop writers, Fred Colvin and Frank Stanley, in which owners and managers, foremen and shopmen can find practical means of straightening out all the intricacies of running a machine shop for maximum productiveness.

Running a Machine Shop

By Fred Colvin,
Editor Emeritus,
American Machinist,
and Frank Stanley,
Editor,
Western Machinery and Steel World,
403 pages, 6x9, 146 illustrations.. $3.50



HERE is the book to answer the questions that don't have to do with machine operations, yet that affect shop profits in many ways. How to set up and equip the shop, how to plan work, how to inspect and control it, where economies may be made, how production may be improved, how to keep records, how to manage men—these are the sort of important problems explained here on the basis of successful methods now in use.

Here are valuable pointers on:

—selecting machinery
—buying used machinery
—keeping machines in condition
—timesaving tool trucks
—moving work about the shop
—conveyors in the job shop
—toolroom layouts
—making the tool crib pay
—allocating machine hours
—shortening work travel
—estimating on contract work
—estimating from blueprints
—foremen's meetings
—farming out work
—planning for slack times
—modernizing a shop
—Where and when to inspect
—saving motions in assembly
—etc., etc.

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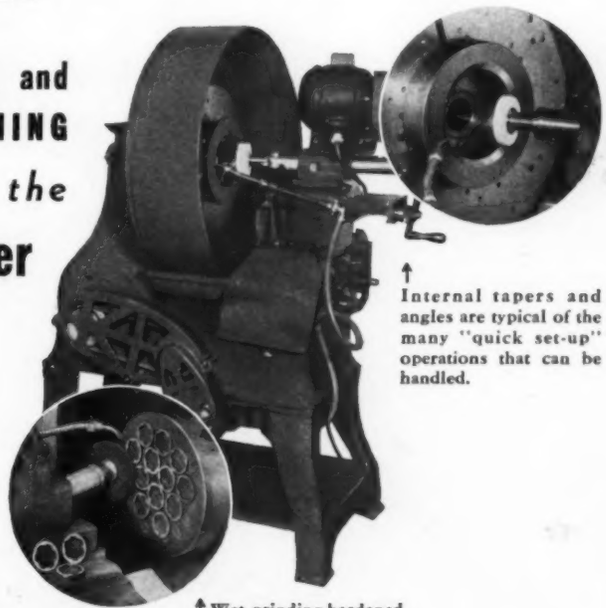

↑ Internal tapers and angles are typical of the many "quick set-up" operations that can be handled.

↑ Wet grinding hardened pieces, using a magnetic chuck. The Lempco Grinder stepped up production on this job.

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And you can't produce machinability merely by squeezing a steel bar down in size while pulling it through a hole in a steel die block. There's a lot more than that to developing machinability in cold drawn steels.

At Union Drawn—ever since its organization as the pioneer producer of cold drawn steels in 1889—increased *MACHINABILITY* always has been given first consideration.

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During more than 50 years of research and practical experience, they've learned enough about machinability and the intricacies of screw steels to fill volumes. They know how chemistry and physical operations that precede cold drawing may affect cutting qualities. They know how slight variance in "drafts"—or reductions in cross-sectional areas during drawing — produce changes in the characteristics of the steel. They've even studied the straightening of bars and discovered just how different steels vary in response to the action of straightening rolls. And these are only a very few of their findings.

Time after time, their efforts have resulted in *better machinability* for users of Union Cold Drawn Steels.

The improvement of UNION FREECUT and the development of UNION SUPERCUT—the *fastest-machining* Bessemer screw steel made today—are good examples of their success. So, too, are the lengthened tool life resulting from elimination of abrasive elements, the fine machined surface and uniform heat-treating qualities being obtained on a regular production basis today with Union Cold Drawn Steels.

Union Drawn metallurgists and engineers are ready to go to work on *your* problems—to help you obtain the greatest possible production efficiency in your plant. They can help you select the best available steel for each job—help you with "set-ups," feeds, speeds and heat treatment methods. They've helped other steel parts producers—they can help you.

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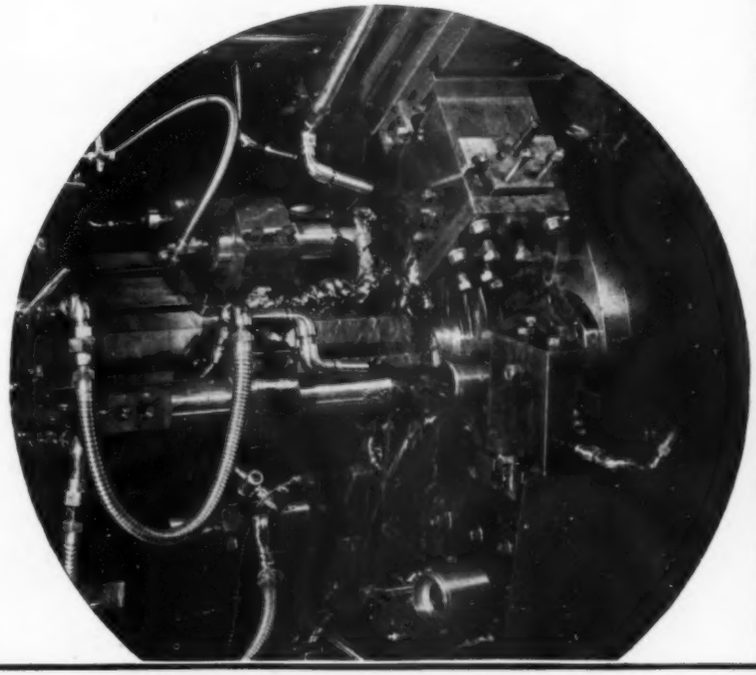

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No. 801 PLAIN

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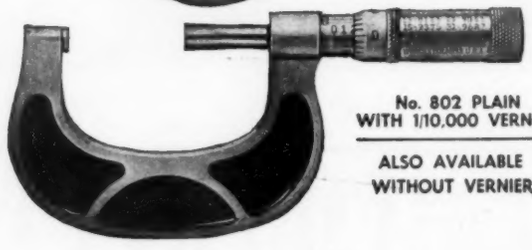

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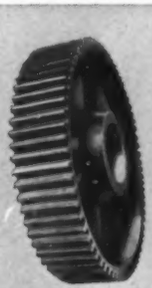

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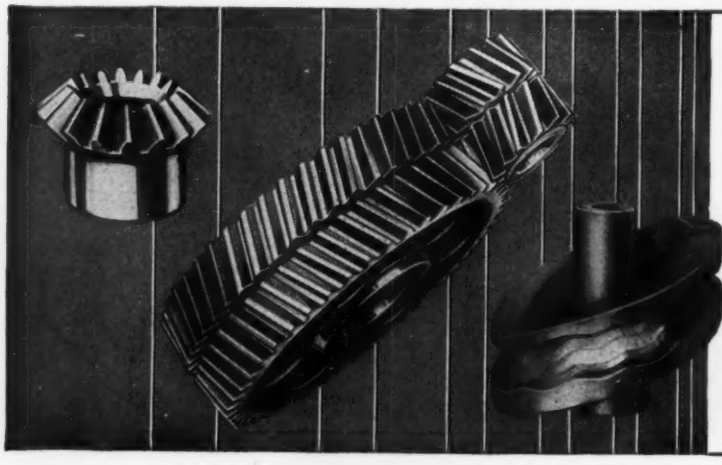

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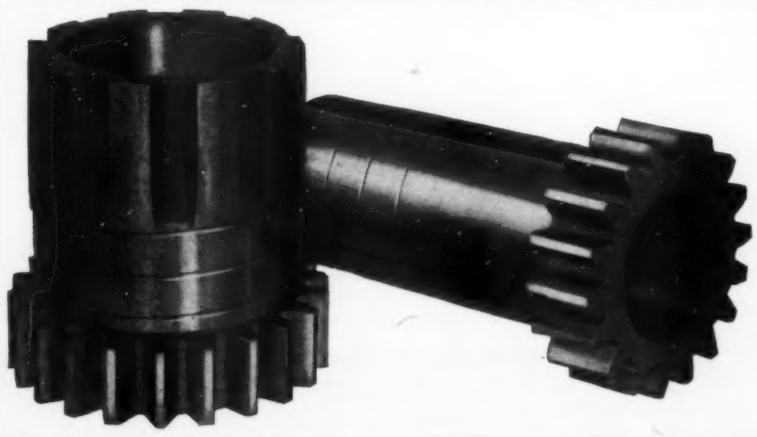

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BEVEL — MITER — RACKS

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THE ADAMS COMPANY

Est. 1883

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★ In one of their recent bulletins on hoists, the National Safety Council says:

> ❝ *Hooks which have become bent on account of overloading should not be straightened and put back in service, but a new hook should be provided. When a hook is once bent the stress in the metal tends to weaken it so that afterward its strength is a matter of doubt and cannot be depended upon.* ❞

That's good advice. With the lives of American boys utterly dependent upon our industrial production, this is no time to take chances which may cause lost time accidents to men or machines, or both.

Watch the Hooks. Wright load hooks are drop-forged from special steel which, when subjected to excessive overloading, give visible warning by opening slowly. When the bottom hook has started to open, look to the top hook, too, for while it is stronger than the bottom hook, it also may be reaching a danger point.

Don't Abuse Your Hoist. Now that we are all faced with restrictions and shortages proper maintenance is of paramount importance. While every **WRIGHT HOIST** is built with load-carrying factors considerably in excess of their rated capacities, like many other well-made pieces of mechanical equipment built for specific duty, they should not be overloaded. Overloading is dangerous—to men, materials, machinery and steady production. Remember—abuse to machinery today is akin to sabotage. Conserve steel and maintain production schedules by careful use, regular inspection and proper lubrication.

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Write for Multi-Disc Clutch Catalog No. 54 or consult Sweet's or Thomas' Register

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

The "Sign Post" points the way to accuracy . . . precision, plus controlled production. The need for "Gears, Good Gears Only" is greater today than ever before . . . . .

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
1825 Reading Road • Cincinnati, Ohio

Power lost in transit means LOST PRODUCTION

Enlist MORSE CHAIN DRIVES TO Convoy

Vital Machine Power Without SLIPPAGE OR WASTE

Like ocean convoys, power in transit needs protection too . . . it faces many hazards of the elements, over-loads, shocks—which if not properly protected against with efficient drives will result in slip, power waste, and lost production.

Don't take chances. Make sure every drive in your plant delivers maximum production capacity with Morse Silent and Roller Chain Drives—no slip—no power waste.

The exclusive "Rocker Joint" Morse Silent Chain and Morse Roller Chain keep rolling years longer at constant efficiency under the severest conditions.

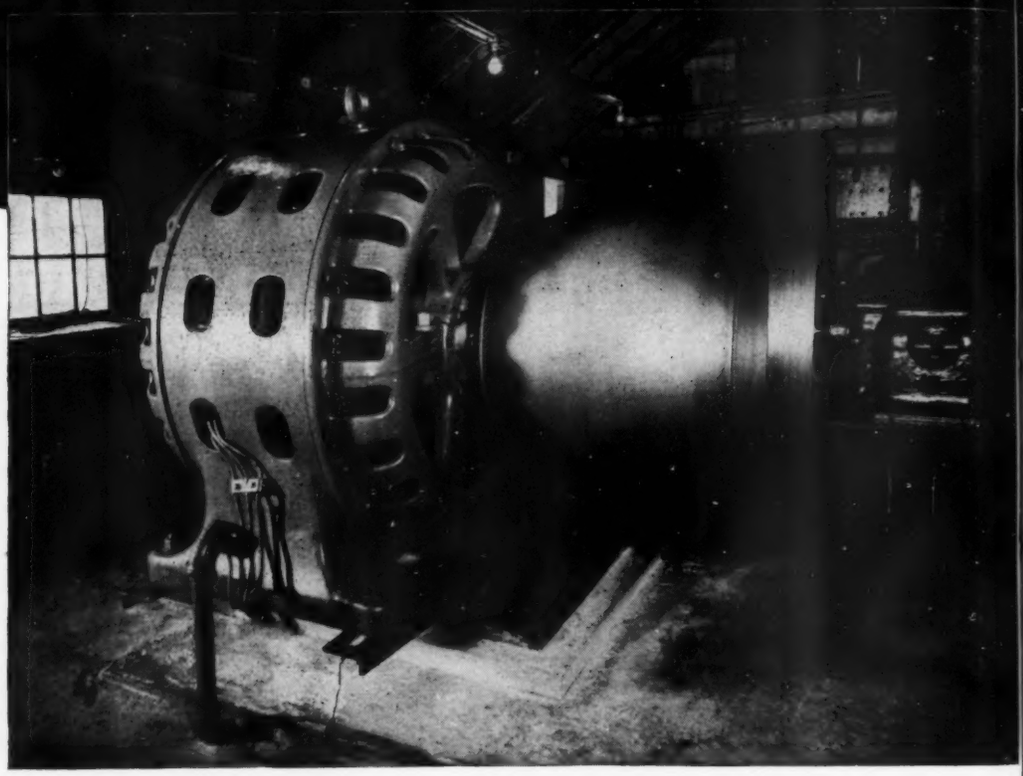
Regardless whether your requirements involve the conventional drive or one of the many unusual chain applications—there is a Morse Chain that will "Deliver the Goods". All sizes and capacities, single and multiple widths. Consult the Morse man in your territory today.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE positive DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.

AMERICAN



Econ-O-Matic Drives Mean Automatic Economy

American Econ-O-Matic* Flat-Belt Drive

Lengthens Belt Life, Cuts Power Costs at Coeur d'Alene Mine!

At the Coeur d'Alene Mines Corporation, Wallace, Idaho, producers of silver, lead and zinc essential to the war effort, a large air compressor drive was giving trouble.

Problem: The compressor drive operated with a gravity tightner pulley. The 27" leather flat-belt on this drive was pulling against the tightner under constant tension. Because of this severe service, the belt had developed a bad "burn" and was about to be scrapped.

Solution: An **American Econ-O-Matic Flat-Belt Drive** was installed, incorporating the unique American Motor Base that gives automatic tension control. As a result, the idler or tightner pulley was eliminated. Also, the "American" representative removed the belt burn while shortening the belt to take up the slack resulting from elimination of the tightner.

Results: The original leather belt was not only saved—it is expected to give years of trouble-free service! *Power consumption* has been *reduced*. *Compressor efficiency* has been *increased*. These benefits have been achieved because:

1. Belt slip is eliminated.
2. Belt wear is reduced...no reverse bend under tightner.
3. Original center distance has been retained, but the belt travels a shorter distance and operates more efficiently since the tightner pulley has been removed.
4. Bearing life is lengthened, because there is no jerking on the bearings from the tightner pulley.
5. Maintenance costs less and requires fewer man-hours . . . with *automatic* tension control replacing manual adjustments.

What You Can Expect from American Econ-O-Matic Drives

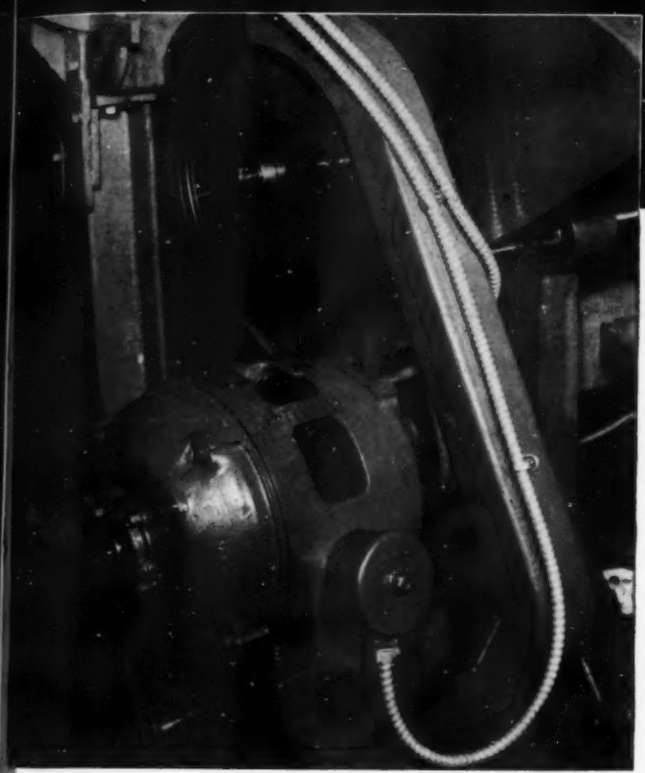
- ★ Increased production because correct RPM level is sustained . . . no belt slip.
- ★ Low first cost quickly saved in reduced power consumption.
- ★ Man-hours and materials required for maintenance reduced up to 75%.
- ★ Bearing pressure reduced by 50%.
- ★ Belt life increased by an average of 100%.

Let our engineers prove these economies to you!

THE *American*

4275 WISSAHICKON AVENUE

ECON-O-MATIC* DRIVES



AMERICAN Drive Selection Service

HOW ABOUT IT?

Want the quickest and most efficient answer to your Short-Center Drive Problems? Call for AMERICAN DRIVE SELECTION SERVICE. Our engineers and distributors are installing both Flat-Belt and V-Belt Drives every day in the year. They can give you impartial advice on the type best suited to each operating condition in your plant. Write us about your problems *today!*

American Econ-O-Matic* V-Belt Drives

Improve Knitting of Fabrics and Cut Electrical Equipment Costs!

Alfred Hofmann & Company, West New York, N. J., maker of "Simplex" machines for knitting glove fabrics and rayon cloth, needed a drive to meet special conditions.

Problems: 1. The "Simplex" machine requires a drive that can be varied slightly in speed—only enough to compensate for an occasional change in the material being knitted.

2. The drive should come up to full speed quickly and then hold this speed without fluctuations. Fluctuations in machine speed *during* a production run cause visible flaws in the knitted fabric.

Solution: An **American Econ-O-Matic V-Belt Drive** for each knitting machine. This drive includes the American Motor Base for automatic tension control, and thus sustained speed without belt slip. Also, the drive incorporates American Adjustable-Diameter Wedgbelt Pulleys, which permit occasional speed changes, *between* production runs on different fabrics.

This American Econ-O-Matic V-Belt Drive operated by an induction motor replaces a rotor-wound motor with resistor controls to achieve speed variations. This previous system needed manual control, started unevenly, and then did not maintain speed, since the motor became hot and built up resistance.

Results: With **American Econ-O-Matic V-Belt Drives**

1. Knitted fabrics are produced more uniformly . . . machines now operate at constant speed.
2. A variety of fabrics can be knitted on the same machine, by simply adjusting diameters of the Wedgbelt Pulleys *before* any given production run.
3. Savings of at least 50% have been achieved in the cost of electrical equipment for each knitting machine.

Pulley COMPANY

PHILADELPHIA, PA.

E Navy "E" for excellence awarded February 12, 1942

***Econ-O-Matic Drives** are short-center drives, either flat-belt or V-belt, with American Motor Bases for automatic tension control—and thus *automatic economy.*

Conserve steel and

USE PRODUCTS MADE

● These are "specials" photographed to show the wide variety of designs of headed and threaded products that can be made on modern bolt and nut machinery in the Lamson plants. Some of these parts only remotely resemble bolts, but they are all made on bolt-making machinery—and few require secondary operations!

There are three fundamental reasons why these facts may be very important to you in your production and assemblies if you use parts which resemble any of these shown and which are now made on screw machines.

1. If a part now made on screw machines can be made on bolt-making machinery (by upsetting) you will save raw materials in the manufacture—from a little to as much as 75% of the stock! Heading and threading on bolt-making machinery today is done to very close tolerances, with a minimum amount of scrap—an important consideration when every pound of steel is ear-marked for a purpose.

2. If the part now made on screw machines *can be made on upsetting machinery,* you will release a machine tool badly needed to make another part *which can only be made on a screw machine.*

3. Upsetting and threading a part compared with production of that same part on screw machines may be many times faster, much more economical and in every way as satisfactory as the milled product. Modern bolt-making machinery such as we have in the five Lamson plants is geared to high speed production without sacrifice of any qualities required.

You can specify upset products with a reasonable expectation of reducing your costs and getting better deliveries. You can do this without sacrificing standards of accuracy, strength or finish. Right now the aviation industry is obtain-

...non-ferrous alloys....

...BY HOT AND COLD FORGING!

ing from Lamson & Sessions similar products to those illustrated that pass every conceivable kind of inspection and the most rigid laboratory tests.

And there are other advantages in using upset products which may as yet be unfamiliar to you. For instance: due to the most modern heat treating equipment, Lamson & Sessions' engineers are producing from carbon steel, properly heat treated, headed and threaded parts which are the equal of, or superior to, the same parts formerly fabricated from an expensive alloy steel. This is another economy for the user—means faster deliveries of raw materials *to us* and faster deliveries of the finished products *to you.*

And there is this to remember too—many plants are still using alloy steel for headed and threaded parts without realizing the progress that has been made in the bolt industry in producing stronger products, as for instance: Lamson & Sessions makes automotive cap screws with a minimum tensile strength of 150,000 lb. psi in diameters up to ½-inch; up to 125,000 lb. psi in diameters up to and including ⅝-inch; up to 115,000 lb. psi in diameters over that! This means that any design based upon data showing 60,000—65,000 lb. psi for standard bolts or cap screws is using a long obsolete standard—a "bottle-neck" we can break for you immediately.

Important: Steel hand-book tables are not reliable yardsticks for physical properties of bolts because a modern heat treated bolt has higher values than indicated by such tables. Physical values in steel tables are based on results obtained from .505 test specimens. Threaded parts have higher values because the threads act like fins on an airplane motor cylinder. This means that the mass of a threaded section has a greater surface exposed to quenching and results in deeper hardening and higher physicals than a smooth test specimen.

Bear in mind that it is no reflection on your engineering department to come to *bolt specialists* such as Lamson & Sessions with your bolt problems—for our experts in bolt manufacture are ready and willing to give you specific information on your problems, which you may have for the asking.

These three books will help you in specifying and buying standard bolts and "specials"

The Lamson Blue Book—our complete catalog of *standard* products excepting our aircraft products.

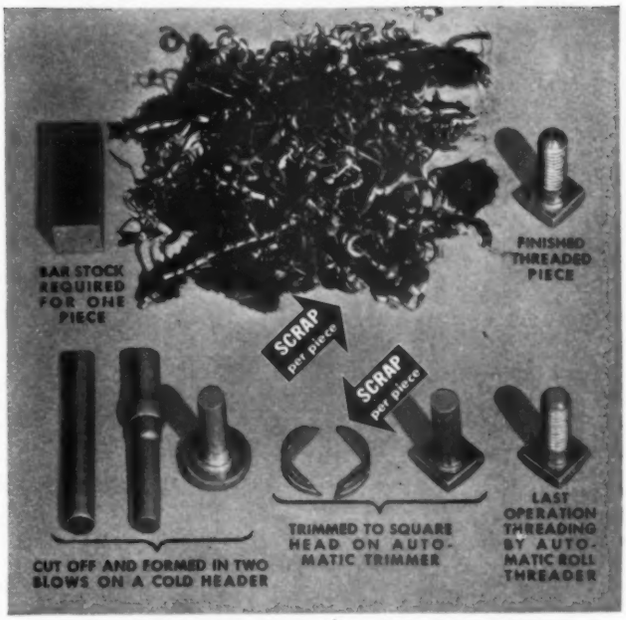
"Bolts, Nuts and Screws"—70 pages of technical and practical information. First copy gratis if requested on your letterhead; additional copies *one dollar each.*

"Bolt, Nut and Rivet Standards"—175-page book published by the American Institute of Bolt, Nut & Rivet Manufacturers, 1550 Hanna Bldg., Cleveland, Ohio; Price *one dollar* per copy. (Order from the publishers, please.)

THE LAMSON & SESSIONS COMPANY

1971 West 85th Street • Cleveland, Ohio

Plants at Cleveland and Kent, Ohio; Chicago and Birmingham

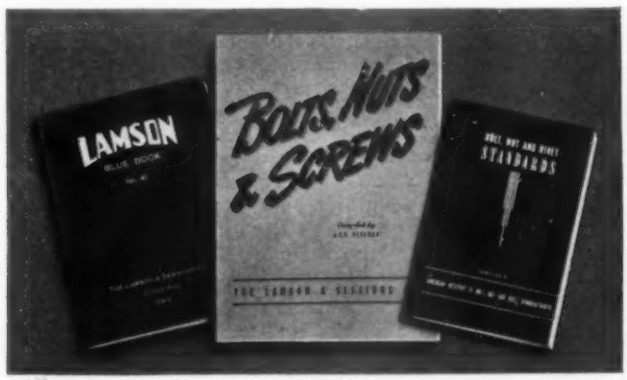

BAR STOCK REQUIRED FOR ONE PIECE
FINISHED THREADED PIECE
SCRAP per piece
SCRAP per piece
CUT OFF AND FORMED IN TWO BLOWS ON A COLD HEADER
TRIMMED TO SQUARE HEAD ON AUTOMATIC TRIMMER
LAST OPERATION THREADING BY AUTOMATIC ROLL THREADER

Here is an actual example of how cold forging (upsetting) conserves raw materials, reduces scrap in making $\frac{5}{16}$" x 1" square head machine bolt of Monel metal.

	MILLED FROM THE BAR	MADE BY COLD FORGING
Weight of Finished Bolt per 1000 pieces	Approx. 36 lbs.	Approx. 36 lbs.
Raw Material Required	110 lbs.	47 lbs.

There is approximately *7 times* as much scrap metal produced by milling as by upsetting in this instance.

A recent excellent article "Cold Header or Screw Machine?" by Herbert Chase, Consulting Engineer, giving detailed engineering data on the subject of this advertisement, will be mailed free on request.



★ ***BUY U. S. DEFENSE BONDS*** ★

LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

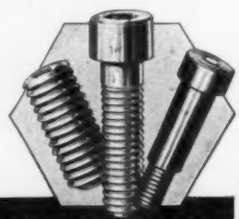
Conserve!

SAVE MATERIAL— save stock — save money as well by making machine parts *less bulky!* Pack more holding-power in smaller parts, narrower flanges, more compact assemblies! Use ALLEN Hollow Screws for further streamlining and reducing structural bulk!

The greater strength of Allen screws permits *smaller* screws to be used. . . Their internally-engaging hex keys require *less room* for wrench-movement in setting up. . . The keys themselves are the most economical form of wrench possible to make, — the most *saving* in metal.

Utilize these Allen features to help Uncle Sam hold on to his precious bundle of stock. He cannot have it wasted; he needs every ounce of metal to hurl at the enemy. Even a *little* saving on *each* machine adds up to the weapons that WIN.

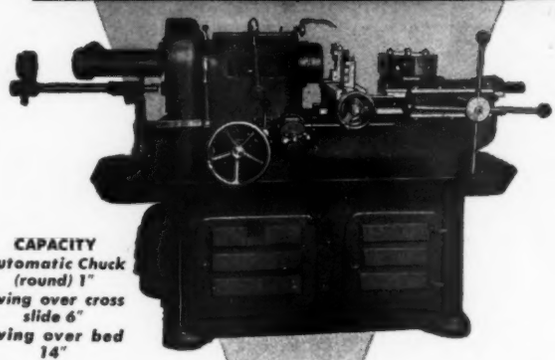
Your local Allen Distributor will accommodate you to the utmost of his capacity and available supplies.



THE ALLEN MFG. COMPANY
HARTFORD, CONNECTICUT, U. S. A.

for ECONOMY—for HIGH SPEED PRODUCTION

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret and Infinite Spindle Speeds

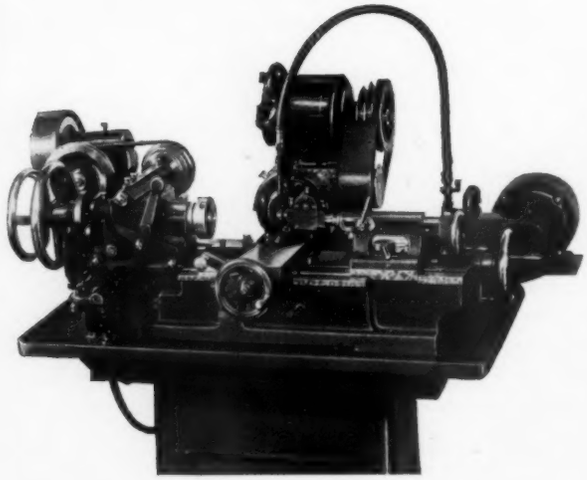


CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.



WALTHAM THREAD MILLER
WITH 3 MOTOR DRIVE

A semi-automatic machine for production or tool room service. It is best adapted for work 2" in diameter or smaller. Special equipment for short multiple cutter work with cam shaft control can be furnished. A cutter head for internal work can also be supplied.

WALTHAM MACHINE WORKS
HIGH STREET WALTHAM, MASS.

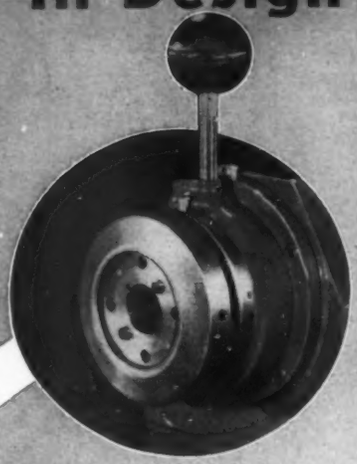
RIVETT AIMS AT PERFECTION

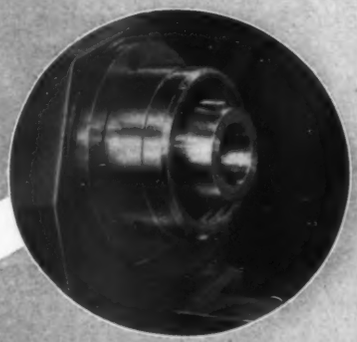
In Performance

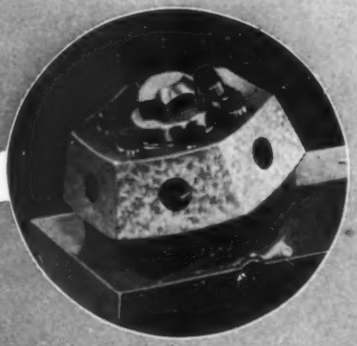
THE RIVETT HAND SCREW MACHINE reflects these objectives in production by its economy operating convenience and precision. The value of this machine should be considered and recognized for initial and second operations on small precision work. Many jobs now produced on heavy, costlier units are more quickly set up and finished to closer limits on Rivett hand screw machines. The "critical," larger machines are thus released for more suitable work.

Send for
Bulletin 918A

In Design







Positive Lever Chucking

Ball Bearing Spindle

Self-Locking Turret

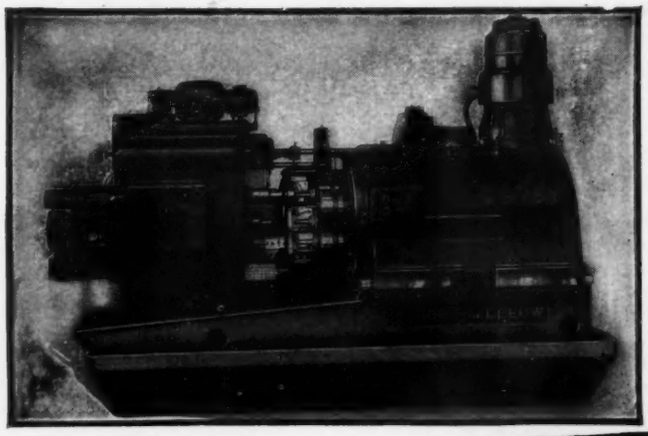
RIVETT 918
HAND SCREW MACHINE

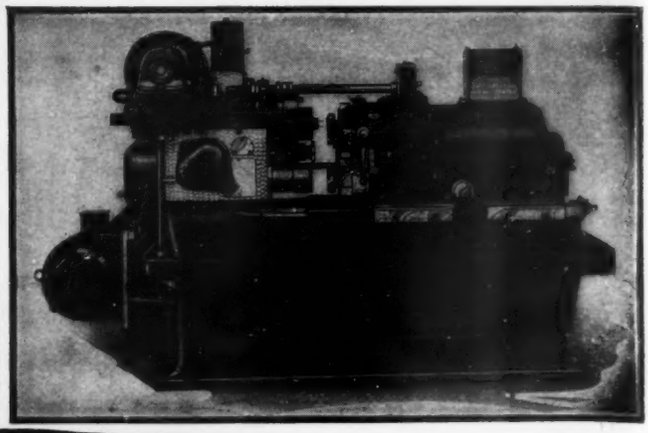
9" Swing over Bed
6" Capacity with Jaw Chucks
6" Capacity with Step Chucks
1" Capacity with Draw-in Collets
or
1" Capacity with Push-out Collets
8 Spindle speeds 150-2500 r.p.m.
or
8 Spindle speeds 225-3750 r.p.m.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

PIONEERS IN BENCH LATHE DEVELOPMENT





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

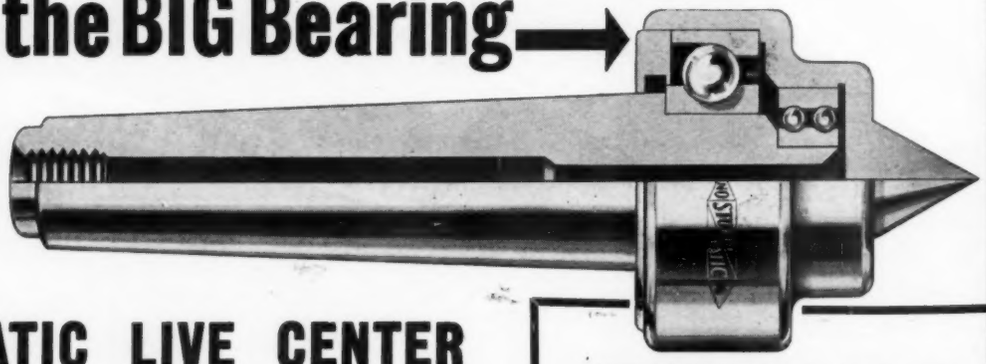
Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

LOOK at the BIG Bearing →

. . . and you will see WHY the



STURDIMATIC LIVE CENTER

Increases Production and Lasts and Lasts and Lasts! ! !

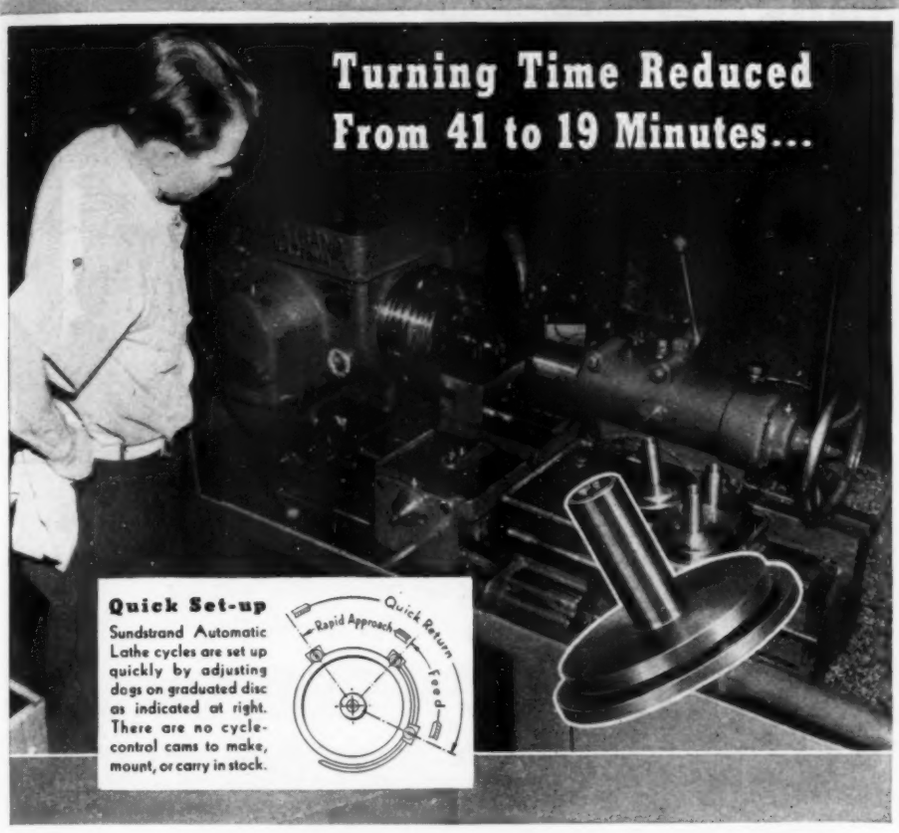
Write for New Illustrated Folder giving complete technical details, specifications, sizes and prices. Standard sizes from stock.

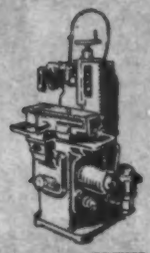
STURDIMATIC TOOL CO. ★
5214 THIRD AVE. DETROIT, MICH.

STURDIMATIC
High-Speed, Heavy-Duty
LIVE CENTERS

- Eliminate "Dead Center" friction.
- Rotate free and easy on ball bearing.
- No distortion of center hole.
- Eliminate chatter.
- Minimum overhang.

Engineered Production


Turning Time Reduced
From 41 to 19 Minutes...
Quick Set-up
Sundstrand Automatic Lathe cycles are set up quickly by adjusting dogs on graduated disc as indicated at right. There are no cycle-control cams to make, mount, or carry in stock.
Quick Return
Rapid Approach
Feed

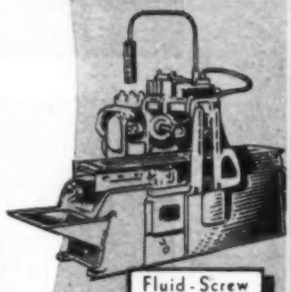

No. 00 Rigidmil

No. 0 Rigidmil

No. 1 Rigidmil

Get This Book

Especially useful to men engaged in new work that involves turning, book A5-391 gives complete information about Sundstrand Automatic Lathes. Write for your copy, today.


Fluid-Screw Rigidmil

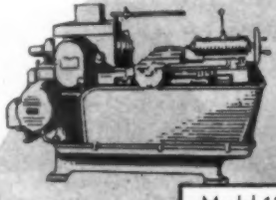
...At A Time When Even Seconds Count

In the Miscellaneous Shaft Department at a large airplane engine plant, Sundstrand Automatic Lathes are saving precious minutes on many turning operations . . . at a time when every *second* has extra value. They frequently double former production, always make operator's work easier.

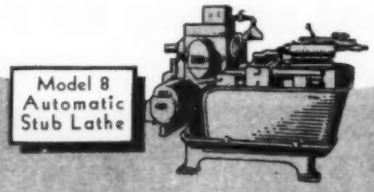
For Example... Three operations on pump drive shaft shown above formerly required 41 minutes and operator's full time. On Sundstrand Automatic Lathe illustrated, same three operations now require only 19 minutes. Twenty-two minutes are saved, production is increased 116%, and operator can do other work while lathe runs through its automatic cycles. When photographed, shaft shown was being processed in lots of 200. Other shaft parts, in lots as small as 50 each, are turned on Sundstrand Automatic Lathes in this department with similar savings.

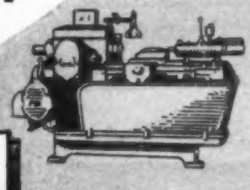
Here's Why... Sundstrand Automatic Lathes make big time-savings and production-increases because they have fast automatic cycles, multiple tooling, wide ranges of speeds and feeds. They are easily set up, can be changed from one average job to another in 20 to 25 minutes. See diagram above for one reason; see book shown at right for many others.

Investigate... See how Sundstrand Automatic Lathes can save time and increase production on your turning. Send us drawings with data and we'll give you Engineered Production proposals.


Model 12 Automatic Stub Lathe

Sundstrand Machine Tool Co.
2533 Eleventh Street, Rockford, Illinois, U. S. A.


Model 8 Automatic Stub Lathe


Model 10 Automatic Stub Lathe

In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details.

RIGIDMILS · STUB LATHES

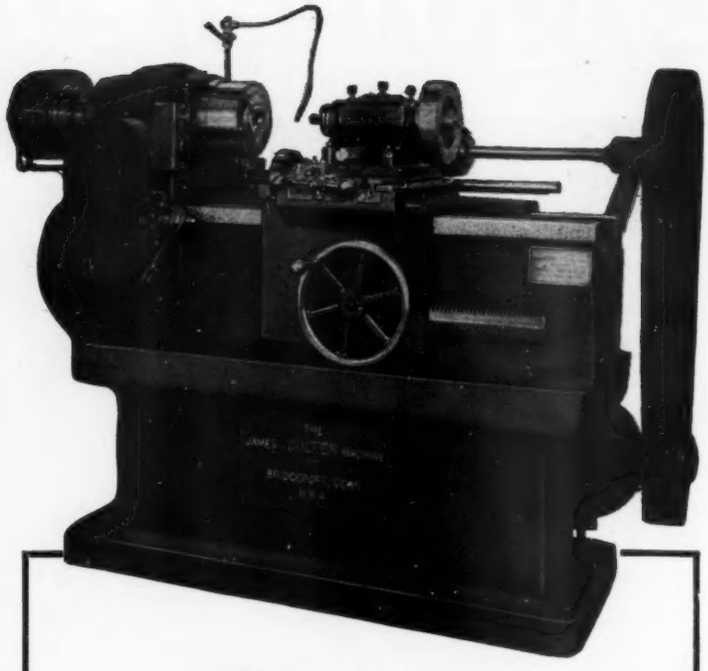
Hydraulic Operating Equipment — Drilling and Centering Machines

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

WALKER MAGNETIC CHUCKS — there's a WALKER for YOUR needs

You are sure to find the magnetic chuck that will exactly fit your requirements when you come to Walker. There's no guesswork because Walker makes all types and sizes, including Rectangular, Swiveling, Vertical Face and Rotary designs.

Then, too, you are assured of having magnetic chucks that are the product of long, specialized experience — chucks that are designed and built right for the specific service intended.

If you need special chucks for special purposes, Walker can supply them promptly and at reasonable prices.

You'll save time and money by specifying "Walker" on your next magnetic chuck order.

No. 618 Bar-Pole Magnetic Chuck

Universal Swiveling Magnetic Chuck

Style "D" Face Plate "Concentric Gap" Type

FULL DETAILS ON REQUEST
Ask for circular W-4

O.S. WALKER CO. INC. WORCESTER, MASS.

REID · SMALLPEICE

MULTI-TOOL PRODUCTION LATHE

. . FOR ARMAMENT WORK UP TO 58" BETWEEN CENTERS AND 18" SWING

. . . takes heavy cuts at top speed

. . . unit design means many machines in one

Versatility and productivity are the outstanding characteristics of the REID-built SMALLPEICE Production Lathe. Unit design makes possible the use of a wide variety of attachments for transforming this machine from all purpose to special purpose requirements or from one job to another quickly and easily.

Because of its versatility and strength this lathe is particularly adapted to armament work where special parts must be turned out in a hurry. Furthermore, the ability of the SMALLPEICE Production Lathe to do the work of many machines in the floor space required for a single machine, makes it a particularly valuable production tool in any shop because it can be used to relieve bottlenecks that might otherwise occur due to delays in getting other equipment.

•

This powerful versatile lathe will rough and finish turn, face, bore, groove form, wave, taper turn, vee, skim turn, profile turn and groove. It is applicable to work on shells, shafts, gear blanks, commutators, rotors, valves and fittings, aeroplane cylinders, liners, pistons and crankshafts as well as bearings, bushings and many other parts.

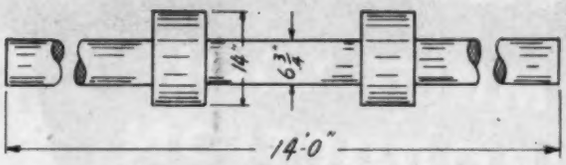
Built in two sizes:

	6 W.S.L.	9 W.S.L.
Swing over bed	12"	18"
Between Centers	18"	22"
Admits between Centers (Long bed)	30"/42"/54"	40"/58"
Spindle Speeds	10	8
No. of Feeds	10	15
Floor space	5'3" x 3'0"	7'8" x 4'0"

Send for Descriptive Bulletin containing detailed specifications

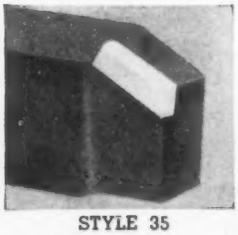
SMALLPEICE, LTD. 160 Elliott St., Beverly, Mass.
Manufactured in U. S. by REID BROS., INC., Beverly, Mass.

EVEN ON **ANTIQUE** LATHES



Feed: .040" per rev. (Lowest obtainable on lathe)
Depth of Cut: 3/8" average

KENNAMETAL TOOLS STEP UP PRODUCTION



STYLE 35

• The work piece sketched above was a large forged piston shaft of 3% nickel .40 carbon steel, annealed. It was rough, forged out of round, covered with scale—and yet it was necessary that machining be done on an old one-speed engine lathe.

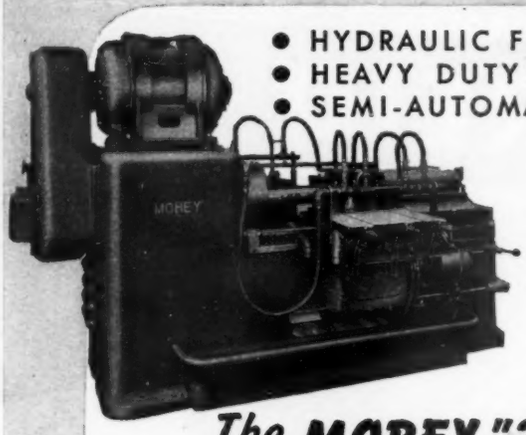
Despite the difficulties presented by this old lathe, a KENNAMETAL Style 35 shear cutting tool successfully machined this shaft. Because of the low power capacity of the lathe, the job required 17½ hours. Nevertheless the same KENNAMETAL tool remained on the job all the time, *without* loss of time for resharpening.

Even if it is necessary that you use old machine tools, KENNAMETAL can help speed your production. Write for our new Vest Pocket Booklet, showing how to get the *most* from KENNAMETAL.

KENNAMETAL THE All American CARBIDE

McKENNA METALS Co.
103 LLOYD AVENUE, LATROBE, PA.
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive in Canada and Great Britain

Suitable for 105 M.M. to 155 M.M. Shells



- HYDRAULIC FEED
- HEAVY DUTY
- SEMI-AUTOMATIC

The MOREY "27" SHELL LATHE

Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.

VITAL AS BULLETS
Machine tools and their accessories such as Drill Bushings are as vital today as the war equipment they produce. To help guard against delays, a large stock of Universal Drill Bushings in standard sizes are on hand, ready for quick delivery. Universals with superfinished bores offer more for your bushing dollar. Write for prices and data sheets.
UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

CUSHMAN CHUCKS are HELPING . .

to BREAK the BACK of the AXIS

WHEREVER metal parts are formed and finished to take their place in the swelling flood of war materiel, Cushman chucks form a "first line of production". Cushman workers and plant facilities are stepping up output to the limit to meet war industry demands. We offer you every cooperation . . . both in engineering and production . . . in our common effort to "break the back of the axis".

* * * * * * * * * * * * * * * * *

A WORLD STANDARD FOR PRECISION

CUSHMAN

CHUCKING ENGINEERS • SINCE 1862

CUSHMAN CHUCK CO. **HARTFORD, CONN.**

VERSATILE

A TOOL MAKER'S MACHINE TOOL!

Boyar-Schultz Floor Model No. 22 Profile Grinder is taking an important place in the change-over from ordinary peace-time production to the speeded-up production for our war effort.

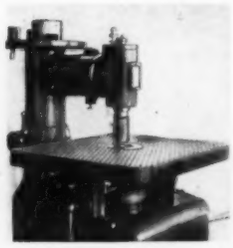
• This Grinder is used in making the tools for turning out airplanes, tanks, guns and other munitions in large quantities.

Any machine tool that shortens the time required for producing tools is invaluable. A Boyar-Schultz Profile Grinder may be what you need.

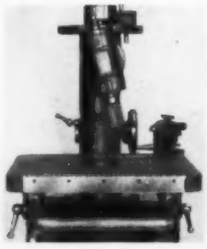
WRITE FOR CIRCULAR

BOYAR-SCHULTZ CORPORATION

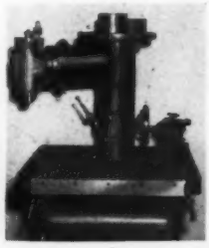
2109-F Walnut Street — Chicago, Illinois



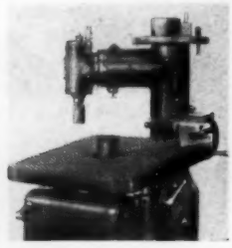
USING THE UPPER SPINDLE



UPPER SPINDLE TILTS TO 10°



USING THE LOWER SPINDLE



LOWER SPINDLE WITH TABLE TILTED TO 10°

SIMPLIFY *and* SPEED UP SET-UPS

with LIBERTY HI-SPEED GRINDING ATTACHMENTS

Designed for the most accurate tool, die and gage work

HORIZONTAL ATTACHMENT
Grinding Gaging Seat on Special Gage

VERTICAL ATTACHMENT
Grinding Clearance of Broach Teeth

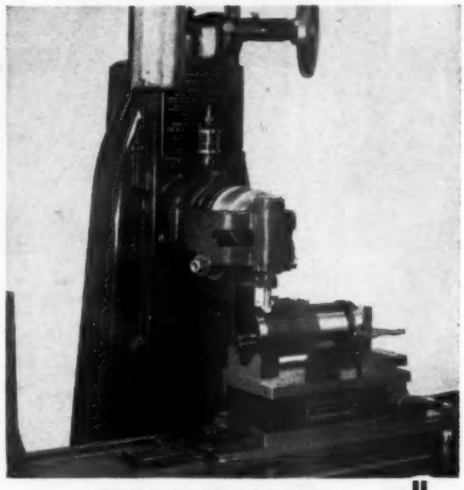
These new attachments provide the means for quick, simplified set-ups—in tool room, die shop and grinding room.

Applicable to the grinding of gages, angles, slots, recesses and difficult-to-get-at surfaces, Liberty Hi-Speed Grinding Attachments speed work and insure accuracy. Places impossible to reach with large wheels are readily accessible; long expensive set-ups, requiring small wheels, are eliminated.

An almost unlimited variety of applications are possible with assurance of extreme accuracy wherever used. Attachment can be made quickly and shifted to numerous positions.

Liberty Hi-Speed Grinding Attachments are available for vertical and horizontal spindles and fit Browne & Sharpe, Reid and other makes of surface grinders.

These units are assembled complete with any size bores, pulley belts and grinding wheels at no extra cost.



VERTICAL ATTACHMENT
Grinding Rectangular Opening in Trigger Casing

FOR COMPLETE INFORMATION WRITE TODAY—

specifying diameter of spindle head, type and make of grinder. Also for Illustrated Descriptive Bulletin.

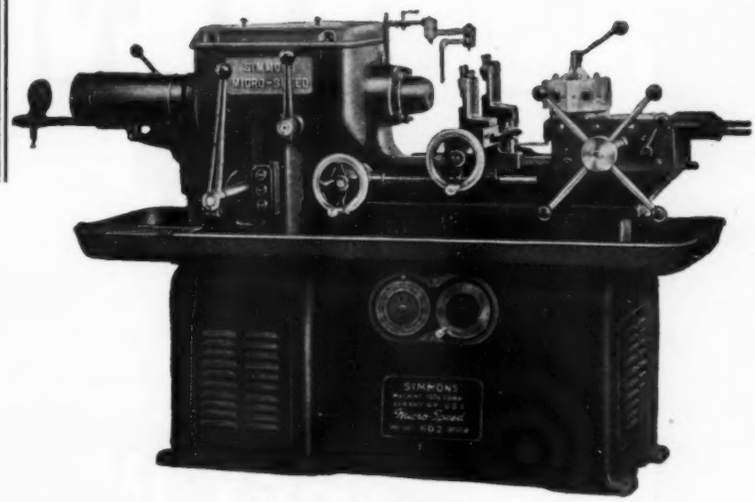
LIBERTY TOOL & GAGE WORKS

PROVIDENCE • RHODE ISLAND

SIMPLE, EFFICIENT to OPERATE!

SIMMONS MICRO-SPEED

TURRET NO. 2 LATHES



1¼" Bar Capacity—14"
Swing. Built in Plain and Back-Geared types

The Right Speed For the Job with:

- **SELECTOR DIAL CONTROL**
- **SPINDLE BRAKE and CLUTCH**

TIMKEN BEARING EQUIPPED

Mechanization for war demands unlimited production of a myriad of precision parts in record-breaking time. This problem, further complicated by the ever-growing shortage of skilled workers, can be overcome with modern, sturdy, simple-to-operate tools.

Simmons No. 2 Turret Lathes answer these requirements fully. They produce close tolerance work *speedily and economically*, with a minimum of confusing devices. For example, the Micro-Speed Drive offers unlimited speed variations and all changes can be made while the spindle is in operation. This enables quick selection of the speed best-suited to the work and cutting tools. A simple oversized brake brings the spindle to rest quickly.

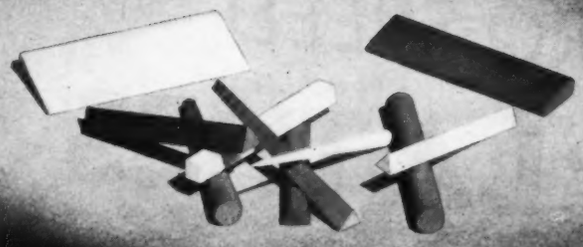
Write today for Descriptive Bulletin detailing other features and complete specifications. Our delivery schedule is reasonably quick!

SIMMONS MACHINE TOOL CORPORATION

Main Office and Plant, 1759 NORTH BROADWAY ALBANY, N. Y.
New York Office, 149 Broadway

SIMMONS
MICRO-SPEED
REG. U.S. PAT. OFF.
LATHES · TURRET LATHES · MILLERS · BORING MACHINES

NORTON ABRASIVES



OILSTONE FILES FOR PRECISION WORK

Today men's lives depend on the precision of instruments and mechanisms. Helping to produce them with the utmost accuracy and finish, are

INDIA
(Oil Saturated Aluminum Oxide)
AND
HARD ARKANSAS
(Natural Novaculite)
OILSTONE FILES

NOTHING COMPARES WITH THEM

30 shapes, 97 sizes, to fit the most intricate tools and dies.

Remember, they are all file throughout — not just a shallow cutting surface.

▲

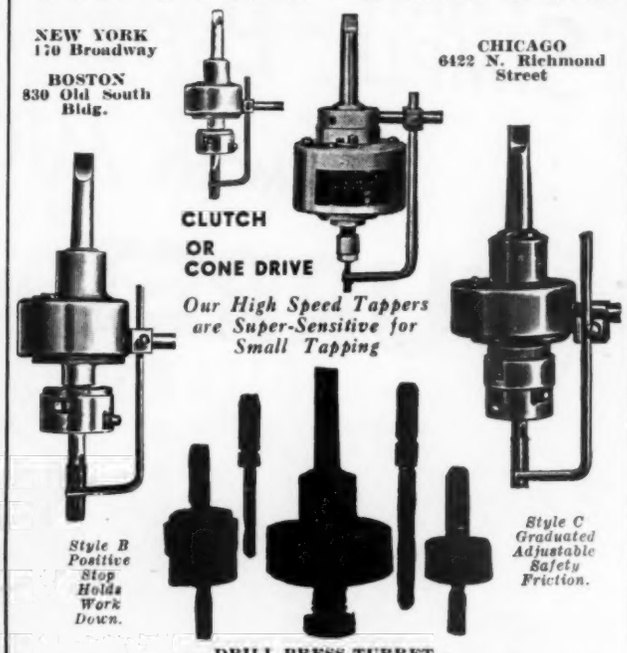
You may have a most helpful folder, "Oilstone Files," illustrating their great variety and use. Just send for it.

BEHR - MANNING
(Division of Norton Company)
TROY, N. Y.

ALSO RELIABLE COATED ABRASIVES SINCE 1872

ERRINGTON
Main Office and Works, Stapleton, Staten Island, N. Y.
TAPPING CHUCKS

NEW YORK
170 Broadway
BOSTON
830 Old South Bldg.
CHICAGO
6422 N. Richmond Street



CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

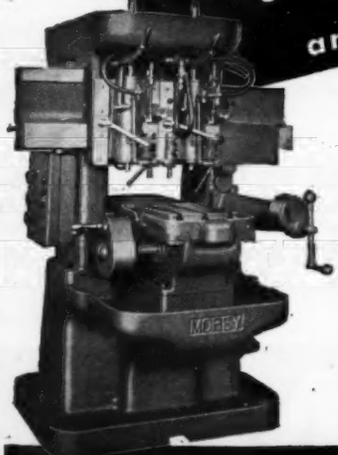
Style B Positive Stop Holds Work Down.

Style C Graduated Adjustable Safety Friction.

DRILL PRESS TURRET
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustments in each tap-holder, if required.
Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

Preloaded Precision Bearings for Spindles

MOREY 12M
HIGH-SPEED
VERTICAL PROFILER and MILLER



Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.

No. 1 Drill Saver

OLIVER-CONDITIONED drills **last longer**—and that's an important point to remember if your drills have a job to do in winning this war! With high speed tools at such a premium, it is important to get maximum service, maximum accuracy from every tool. Slow, wasteful hand-controlled methods are **out!**

OLIVER No. 510 DRILL POINTER

Oliver Drillpointers, by means of high speed, completely automatic action, produce points that are accurate in every dimension on all drills from 1/4" to 3" in diameter. They can be quickly set to produce any point angle from 82° to 160,° enabling you to select the point that is exactly right for the material being drilled. Automatic, cam-controlled action produces the exclusive Oliver hollow-ground point with variable clearances—the point that reduces load on machines, saves drills and speeds up operations.

Favorite in shops engaged in all types of munitions and aircraft production, the Oliver is their No. 1 Drill Saver. Make it your No. 1 choice for keeping every drill in your plant in **war-winning condition.**

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT COMPANY
1410 E. Maumee St., Adrian, Michigan

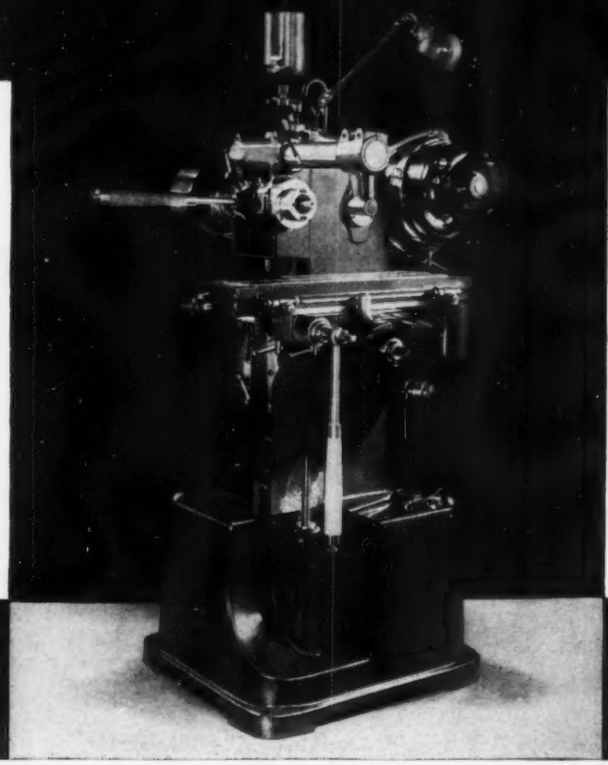
Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

Precision, Sturdiness, High Production and Long Life

are combined in the

NICHOLS HAND MILLING MACHINE



Fast, close work on parts milling is assured by the Nichols Hand Miller. Ruggedness and in-built accuracy place this machine in the class of a modern production tool.

Valuable time savings, especially in tool room service, are offered by the "NICHOLS" because of its compactness and quick, easy set-up. Precision and outstanding versatility contribute also to the adaptability and productivity of this modern machine for tool room use.

An important feature of design which extends the utility and convenience of the Nichols Hand Miller is the vertical head. Operated by hand, the head can be locked in any position. It is also fitted with hand set depth stop. In addition to carrying the spindle, the head supports the heavy overarm for supporting cutting arbor.

Other features of this machine which has longitudinal and transverse feeds of 10″ and 7″ respectively are fully described in bulletin available promptly on request.

Send for Illustrated Bulletin, giving complete information

W. H. NICHOLS & SONS

WALTHAM, MASS., U.S.A.

ARTER

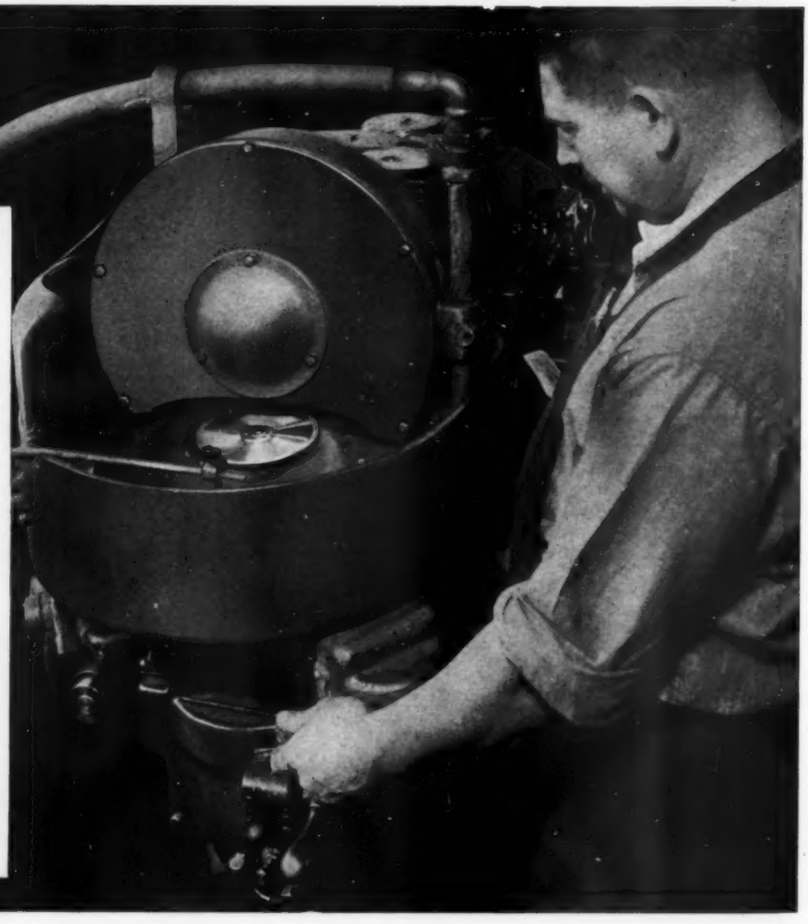
Hyde Manufacturing Company, Southbridge, Mass., for more than half a century manufacturers of quality cutting tools depends on ARTER SURFACE GRINDERS for fast, accurate production.

This operation: grinding Hyde circular blades for cloth, leather, rubber, etc. Both flats and bevels, in step with today's war-plus production requirements.

Arter engineering for increased precision surface grinding is at your service.

ARTER GRINDING MACHINE COMPANY

Worcester, Massachusetts, U. S. A.



"INTEREST" ON YOUR INVESTMENT . . .

To be sure your new, high-speed, high-production equipment will repay you for its installation, give your operators the benefit of highest quality cuttings tools at the workhead, where production is determined.

MORSE

THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

Tapping Trouble?

CHECK THESE POINTS

If your taps are breaking, or not cutting smooth, proper size threads, it may not be the taps' fault. Here are a few things to check to help you locate and correct tap trouble

TYPE OF HOLES TO BE TAPPED

If a blind hole, is there sufficient untapped space at the bottom for the accumulation of chips?

Is a "Gun" tap that shoots the chips ahead being used? (In a blind hole tapped very nearly to the bottom and having no recess, the "Gun" tap is not recommended.)

Do conditions call for a two or three fluted tap?

CLASS OF FIT REQUIRED

If the tap produces an oversize hole, has the proper tap been selected for the class of fit desired?

If proper tap is being used, is there any play in the work or tap holding spindles (provided rigid spindles are being used)?

Do the work and tap line up accurately?

Is the tap dull?

TYPE OF MACHINE

Is drive uneven because of slipping belts?

Is machine powered properly?

Are tap and drilled hole in alignment?

Is there undue wear on sliding parts?

TAPPING SPEEDS

Is the speed too slow?

Is the speed too fast?

TAPPING DIFFERENT MATERIALS

Has the tap proper cutting face for the particular material being tapped?

Is the tap of the proper design or type?

This is one of a series of advertisements published by the Greenfield Tap and Die Corporation to help users get greater production from their taps. The entire series is now available in booklet form. Send for a copy.

PROPER HOLE SIZES BEFORE TAPPING

Is the drilled hole of the proper size?

Is the drilled hole perfectly round?

Is the axis of the hole parallel to the axis of the tap?

LUBRICATION

Has the proper lubricant been employed?

Does the lubricant flood the tap sufficiently while engaged in the hole?

Is there sufficient force behind the lubricant to wash away the chips?

If applied with a brush has the lubricant a sufficiently heavy body to adhere to the tap? (A light lubricant will be thrown off the revolving tap before it enters the hole.)

TAP HOLDING DEVICE

Is worn or wrong type of holder being used?

Is holder in alignment with drilled hole?

CHAMFER

Is the point diameter of tap correct for the size of hole being tapped? Does the tap enter the hole an excessive number of threads before taking hold, thereby losing the full benefit of the entire chamfered portion?

Is the chamfer the correct length?

Is the chamfer chipped or dull and in need of regrinding?

Is the chamfer relief too great or not sufficient?

"Maxi" Tap, for abrasive metals
"Gun" Tap for through holes in stringy metals
Standard Tap for average production operations

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
DETROIT PLANT: 2102 West Fort St.
WAREHOUSES in New York, Chicago and Los Angeles
In Canada: GREENFIELD TAP & DIE CORP. OF CANADA, LTD., GALT, ONT.

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

EXCELLENT INVESTMENTS

FOR VICTORY

BUY

UNITED STATES SAVINGS BONDS AND STAMPS

FOR PRODUCTION

invest a 3-cent stamp to find out the details of the modern line of Lovejoy Milling Cutters — the cutters that thrive on coarse feeds, high speeds, and a 24-hour schedule. It's the solid forged bodies, interchangeable positive-locking blades, and blade economy that make the big difference. Investigate today by using the handy coupon.

LOVEJOY POSITIVE-LOCKING MILLING CUTTERS

LOVEJOY

TOOL CO., Inc.

SPRINGFIELD, VERMONT
U. S. A.

Please mail me the 24-page Lovejoy catalog covering the full line of Lovejoy Mills.

NAME.....TITLE.....

COMPANY .....

STREET .....

CITY.....STATE.....

A.M.

FROM PACIFIC TO ATLANTIC

70 Vernon Dealers TO SERVE YOU!

PROMPT DELIVERY

MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON — LOS ANGELES, CALIFORNIA

Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

BOSTON, MASS. AUSTIN-HASTINGS CO., INC.
BUFFALO, NEW YORK R. C. NEAL CO., INC.
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DETROIT, MICHIGAN JOHN E. LIVINGSTONE CO.
INDIANAPOLIS, INDIANA INDIANAPOLIS MACH. & SUP. CO. OATIS-BOOTH MACHINERY CO.
KANSAS CITY, MO. EICHMAN MACHINERY CO.
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TULSA, OKLAHOMA MASCO EQUIPMENT CO.

CANADA — ALL CANADIAN OFFICES OF THE CANADIAN FAIRBANKS MORSE COMPANY, LIMITED

NAMES OF DEALERS IN OTHER AREAS SENT UPON REQUEST

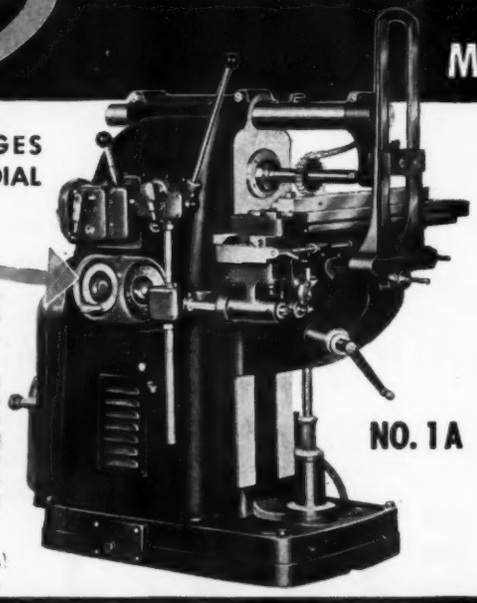
SELECTOR DIAL CONTROL

MILLING MACHINE

WITH

MICRO-SPEED DRIVE

INSTANT SPEED CHANGES AT THE TURN OF THE DIAL



NO. 1A

Quick Deliveries

Today's intricate weapons of war call for small precision parts in tremendous quantities. Simmons No. 1 A Milling Machine is ideal for that type of production. Here's the reason.

The Simmons Micro-Miller, equipped with our own variable speed drive and spindle brake, offers a wide range of speeds (56 to 630 RPM), any of which may be instantly obtained by a turn of the handwheel adjacent to the Selector Dial on the column. Result? The Right Speed For The Job. And that means higher precision . . . faster, more economical production!

Write TODAY for new illustrated brochure.

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY, ALBANY, N. Y.

CHECK THESE FEATURES

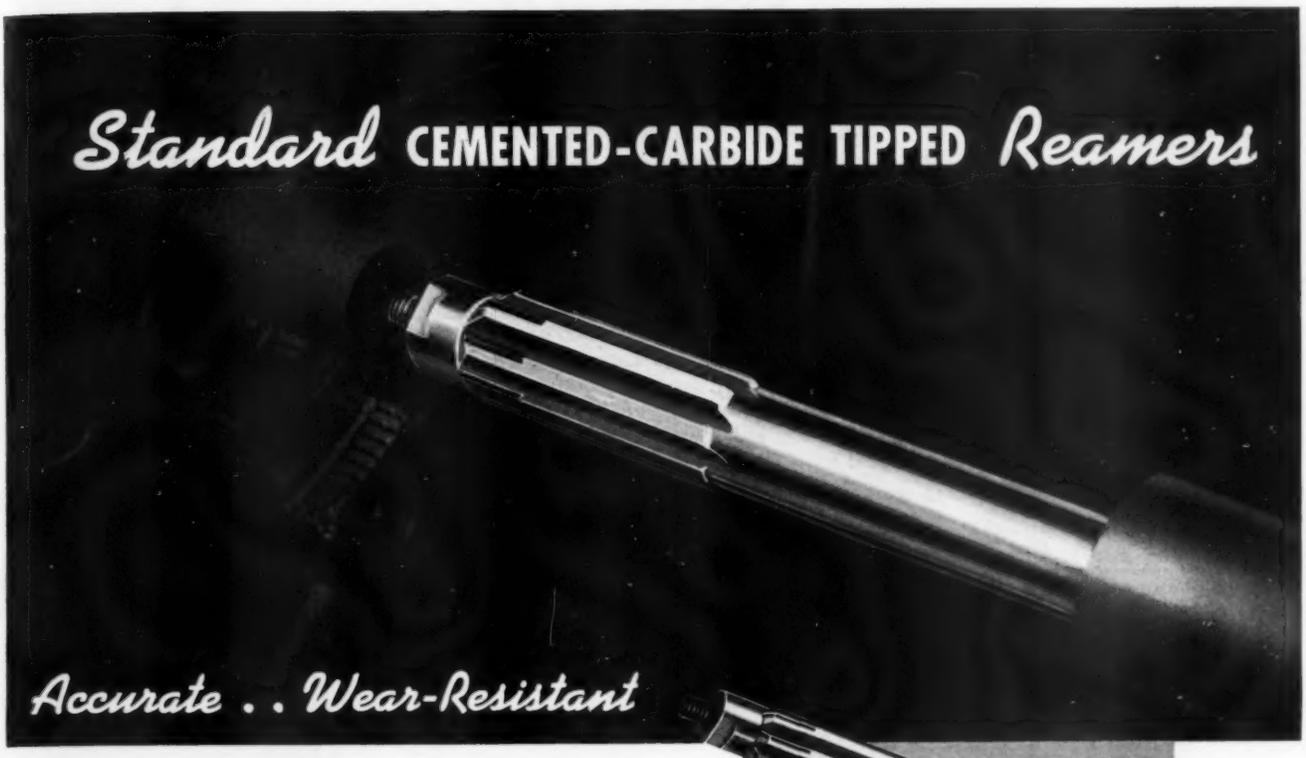
- Speeds 56 to 630 R.P.M.
- Feed Range: Longitudinal 34"; Cross 8"; Vertical 18½"
- Micro-Speed Drive
- Spindle Brake and Clutch
- Selector Dial Control

SIMMONS

MICRO-SPEED

LATHES · TURRET LATHES · MILLERS · BORING MACHINES

Standard CEMENTED-CARBIDE TIPPED *Reamers*



Accurate . . Wear-Resistant

and DELIVERED PROMPTLY

● Cemented-carbide tipped expansion reamers or solid reamers . . . with straight or taper shanks . . . in the sizes you require for present production. They are made to the highest possible degree of accuracy and, with blades tipped with cemented-carbides, that accuracy remains constant over a long period of time. Prompt delivery can almost always be promised, as a wide variety of sizes is carried in stock.

These tools offer many features to make their use particularly advantageous for present-day reaming operations. Expansion reamers are absolutely positive in locking for size. They provide maximum expansion of blades to provide long life. (Expansion of .030" in half-inch reamer.) Their simple construction assures trouble-free service. Solid reamers are held to extremely close tolerances, and manufacturing methods such as the hardening of bodies to Rockwell 58 C guarantee top performance wherever they are used.

A complete catalog listing all sizes and prices will be sent immediately upon request.

Carbide Fabricators also manufacture and design all types of special cemented-carbide tipped reamers. Estimates will be given gladly on any reamer to be made to your specifications.

We are authorized suppliers of Carboloy, Vascoloy-Ramet and Firthite cemented-carbides.

CF *Carbide Fabricators* BERKLEY MICHIGAN

DIVISION OF MORSE TOOL COMPANY . DETROIT

Offering you — practical design methods and procedures actually used in engineering design departments

Make use of the experience of other engineers in your designing of the details of industrial machinery and equipment of all types. Save time and effort by using this handbook of standard design data right at your drafting board.

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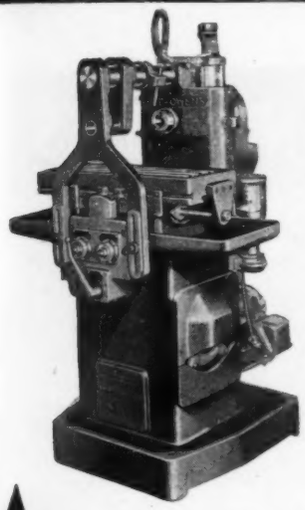

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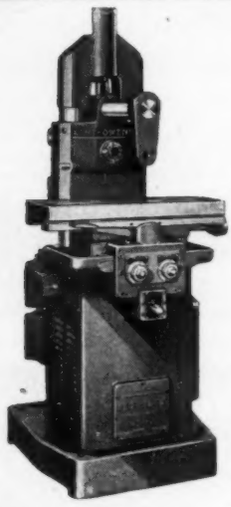

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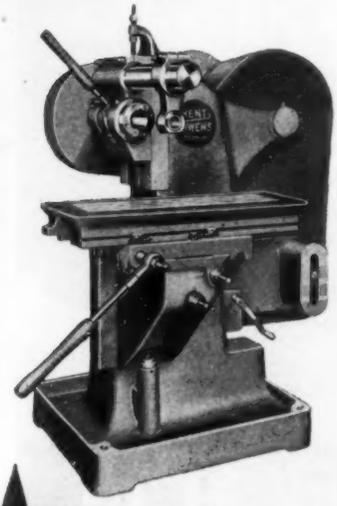

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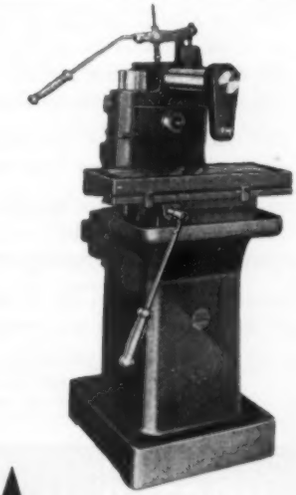
3 H. P. . . hand feed to table and head . . . spindle speed range 100 to 1200 R. P. M.



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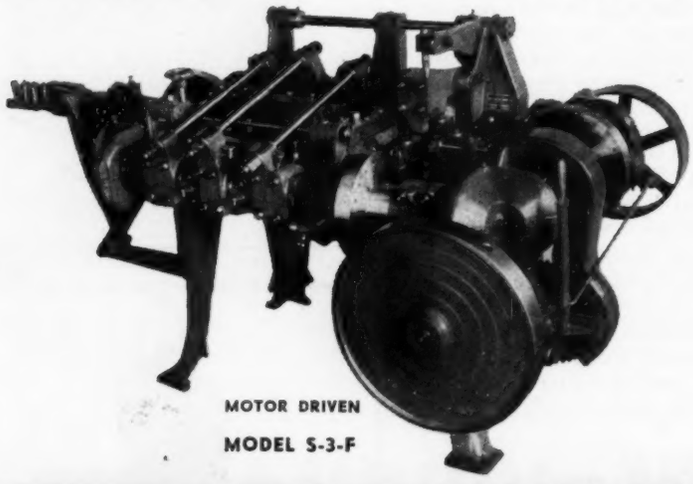
. . . assuring faster work and greater uniformity in parts produced . . . . . .



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MODEL S-3-F

The new Nilson Ribbon Stock Forming Machines are a development—the result of more than fifty years specialization in the design and building of metal forming machines. They can be depended on for speed, durability and accuracy and are built in 4 sizes for handling from 3/32" to 1¼" in diameter and stock from 1¼" to 2½" wide.

Outstanding features include:

. . . open construction of the press and forming tools
. . . patented slide feed has independent cam-operated wire gripping device
. . . power operating wire feed is transmitted through a straight line.

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Nilson is prepared to design and produce special automatic machinery of high productive capacity. Our long experience in this class of work enables us to offer an expert and comprehensive service on special machines. Outline your problem—ask for our recommendations.

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If your cold metal sawing involves cutting stock from 3 inches up, here's the machine to put such operations on a production basis.

This new Porter-McLeod 8" machine is particularly advantageous on larger sizes of stock. *By supporting the blade close up to the* rim of the blade and *pulling* the blade through the cut, buckling of the saw is prevented and accuracy maintained.

The standard feed of this machine is 3 inches a minute but can be stepped up for cutting brass and non-ferrous metals.

Because of the great leverage exerted on the blade through the Porter-McLeod Pull Method of Drive and the support at the rim of the blade, this machine requires less power and assures a straight cut.

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Explore the great time and money-saving possibilities offered by this modern production cutting off machine. Investigate *NOW* by sending for complete details.

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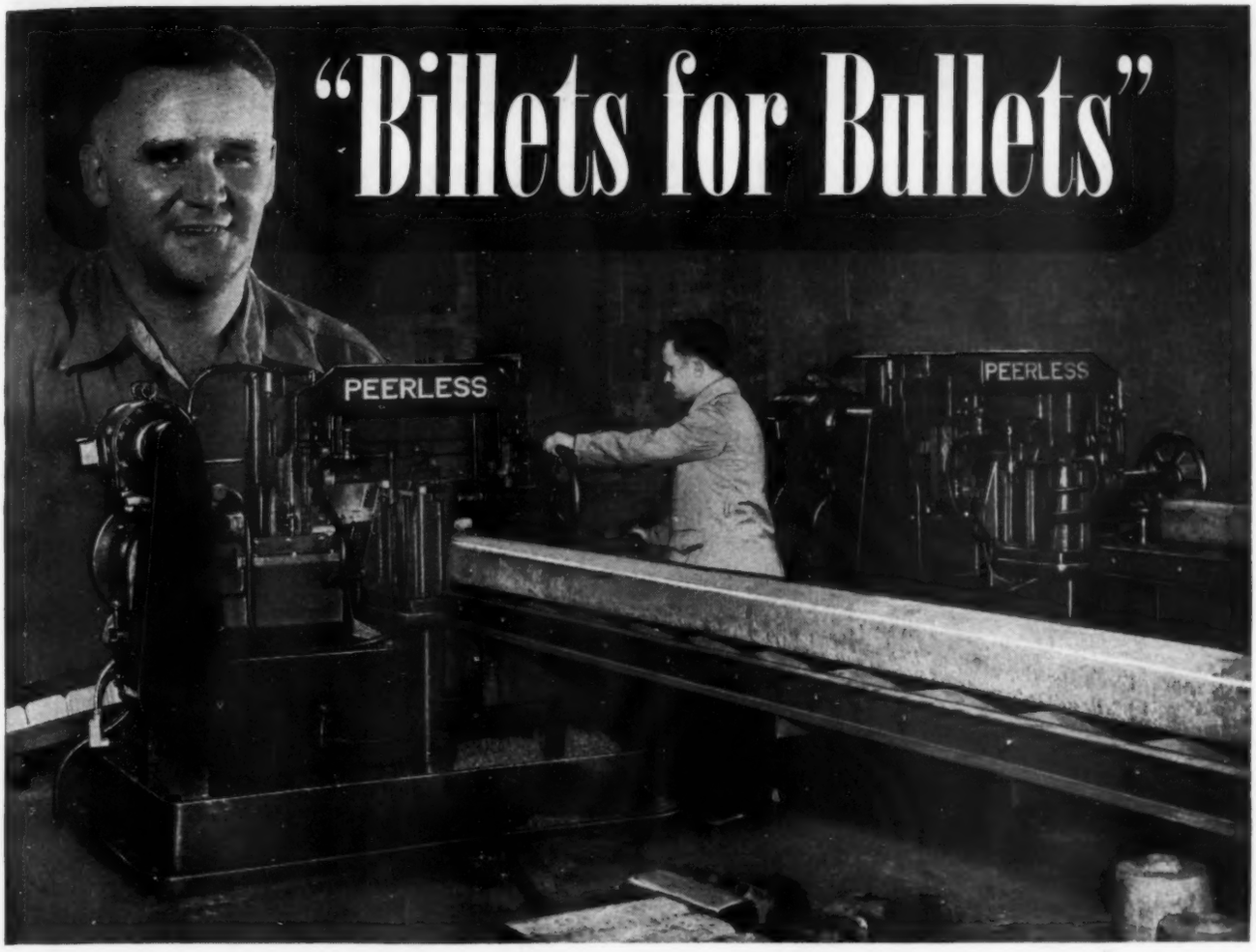

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Billets for 155 mm shells are Sawed on Peerless 14" High Duty Hydraulic machines at a rate of 5 sq. in. a minute. The cool-cutting blade does not fracture or surface harden the metal — as high as 2000 sq. in. are cut with a single blade. The stock is X1335, 5½" x 5½".

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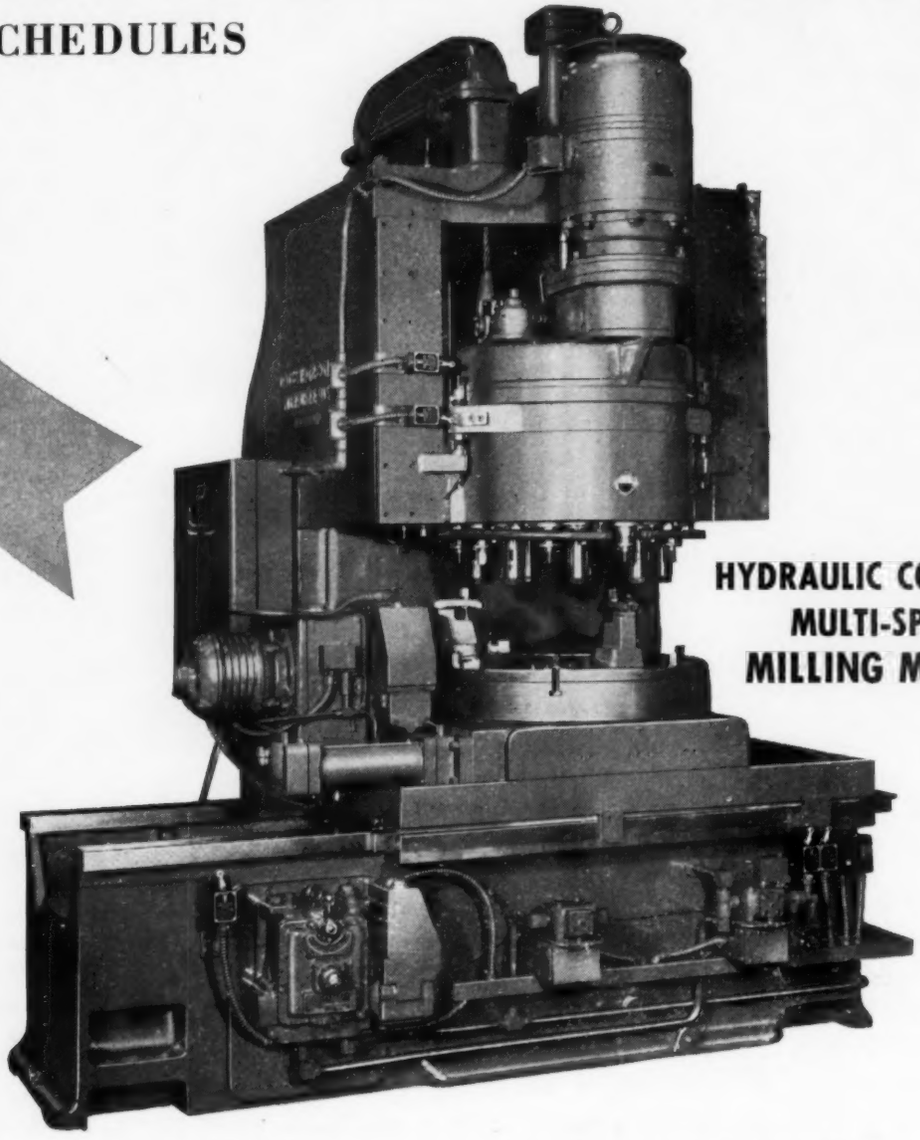
FAST, ACCURATE CUTTING DEMANDS POSITIVE BLADE CONTROL

NEW DAVIS & THOMPSON MILLER

GEARED TO TODAY'S PEAK PRODUCTION SCHEDULES



HYDRAULIC CONTROLLED MULTI-SPINDLE MILLING MACHINE

● Developed to meet the peak demands of our war program, this new Multi-Spindle Rotomatic Milling Machine embodies many advanced features that make possible new production highs. The multi-spindle head is driven by a flange-mounted motor . . . interchangeable gear combinations providing different spindle speeds. Spindles have micrometer adjustments for vertical travel. The self-contained hydraulic unit is mounted integral with the circular table and the reciprocating motion of the table is synchronized with the head action . . . all cycle functions being hydraulically controlled and semi-automatic in operation. Write for further details about this and other new developments in high production Davis Rotomatic Machines.

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DAVIS ROTOMATIC

HIGH PRODUCTION MACHINERY

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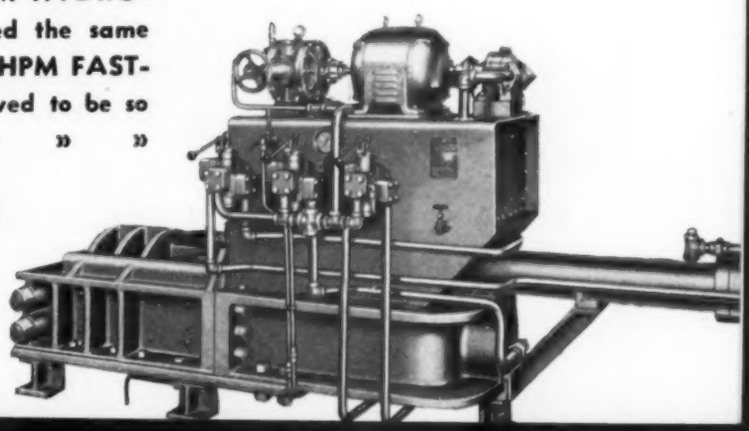
HPM BALING PRESSES handle Scrap Duralumin equally as well as steel!

Reduce your scrap metal trimmings to 5% or 10% of their original bulk with a self-contained hydraulic HPM SCRAP METAL BALING PRESS . . . used universally by the aircraft and metal working industries. Not only will an HPM BALER increase the value of your scrap, but also it will permit easier handling because of the compact size of the bales. ● Powered by the HPM HYDRO-POWER Radial Pump, each HPM Baler is assured the same reliable trouble-free operation as the famous line of HPM FAST-RAVERSE Metal Working Presses which have proved to be so essential in today's all-out Victory production. » » »

SPECIFICATIONS

End Platen Tonnage	140
Side Platen Tonnage	100
Box Size (W. x L. x Ht.)	24" x 48" x 16"
Minimum Bale Size	10" x 10" x 16"
Average Weight of dural bale (lbs.)	90
Dural bales per hour	14



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Mount Gilead, Ohio, U. S. A.

District Sales Offices: New York, Syracuse, Detroit and Chicago
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ETNA *Swaging Machines*

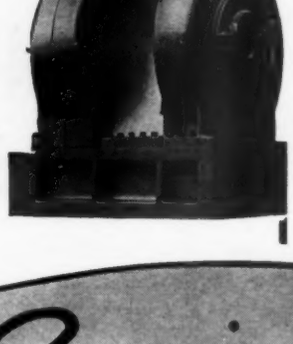
. . . have established an enviable SAVINGS and SERVICE record in their thirteen years of operation at the C. J. TAGLIABUE MFG. CO. . . .

➔ by handling a number of operations (previously performed on lathes and screw machines) at a great increase in production rate, and a savings in metal turning and scrap. From a previous output of 25 to 30 pieces per hour on one particular job, ETNAS stepped up the rate to 150 to 200 pieces per hour on cold work, and 85 to 90 pieces per hour on hot work. In addition, these same ETNA SWAGING Machines (the unit pictured here is one of a battery of 3 Model #156 Series now in its fourteenth year of service) have increased tensile strength and size uniformity. Aside from . . .

. . . handling reducing and tapering operations such *as the one shown here* . . .

➔ the ETNAS in service at TAGLIABUE are similarly used on nickel alloy, stainless steel and forged brass, taking pieces up to 6" in length and swaging them from a maximum diameter of 1½" down to ⅜". These operations at TAGLIABUE, represent the advantages of ETNA SWAGING MACHINES on small parts . . . however, it's well to consider the scope of work ETNAS can handle . . . ETNA SWAGING units are built in capacities from ⅜" to 8", and in die lengths from 1" to 18". Larger sizes can be built to order. Here, then, you can see how ETNAS fill the bill for normal requirements . . .

. . . and for today's stepped up WAR production demands, *ETNAS are continuing to do their share!*



➔ In the current drive to arm America, ETNA SWAGING MACHINES are playing a prominent part. Where speed is essential . . . where accuracy is imperative . . . there you'll find ETNAS doing a job . . . swaging shell blanks, truck axle housings, copper firing bands on 20 m.m. shells, and many other direct war operations. ETNAS are serving today, and they'll serve equally well tomorrow. If your operations could benefit from swaging, get in touch with ETNA at once—complete literature is promptly available upon request.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

THE ETNA MACHINE COMPANY

TOLEDO . . . OHIO

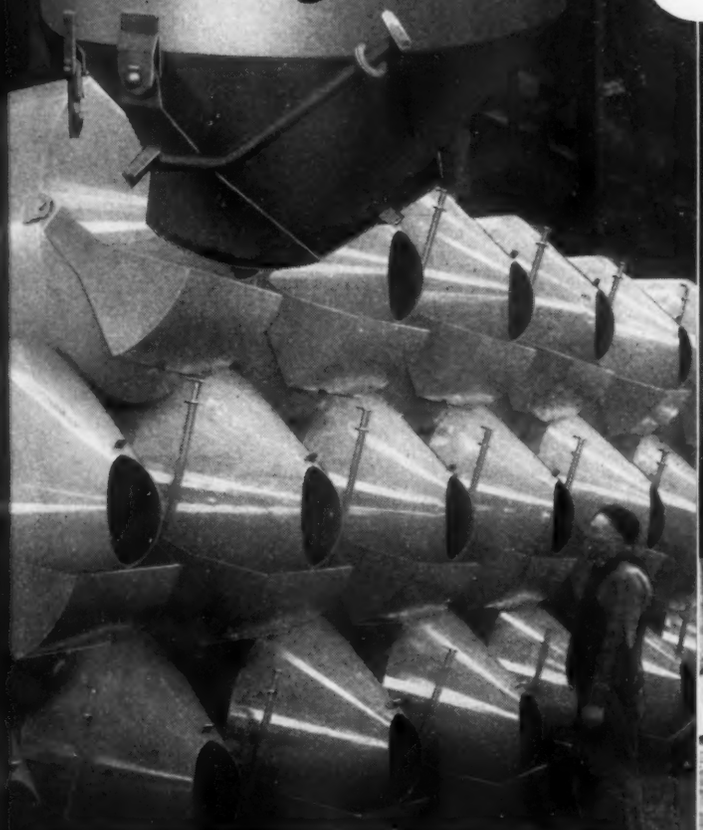
Fabricating BUCKETS on a Bending Press

All parts for these heavy buckets including cylindrical and conical sections, gate, gate arms, and various clips were formed on a Steelweld. Necessary holes were punched on it.

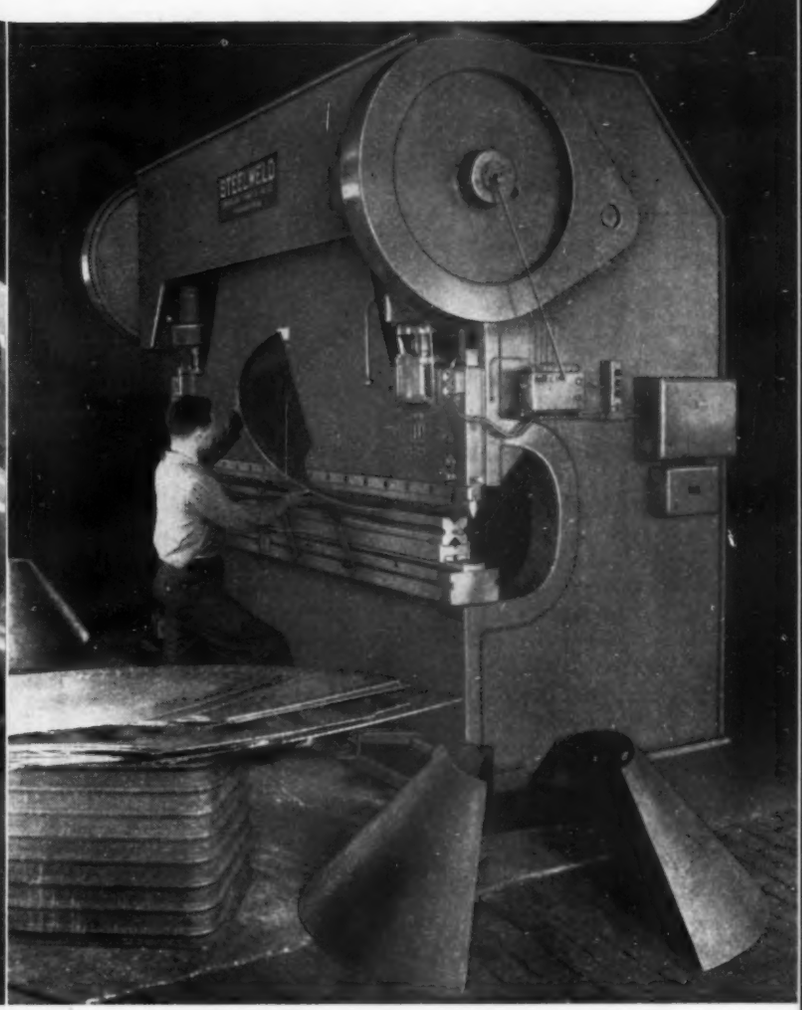
After the plate was cut, only the Steelweld Press illustrated and a welding machine were required to fabricate these buckets.

The many exclusive features not obtainable with any other press make Steelwelds extremely versatile. For instance, with the ram-tapering mechanism, conical sections are easily and quickly made with standard bending dies, the same dies as used for forming the cylinder and straight bending work.

Hundreds of varied jobs can be performed with simple dies on a Steelweld.



These buckets are 48" diameter by 70" high and are made of $\frac{3}{16}$" plate. Steelweld Presses are available for metal of all thicknesses up to one inch.



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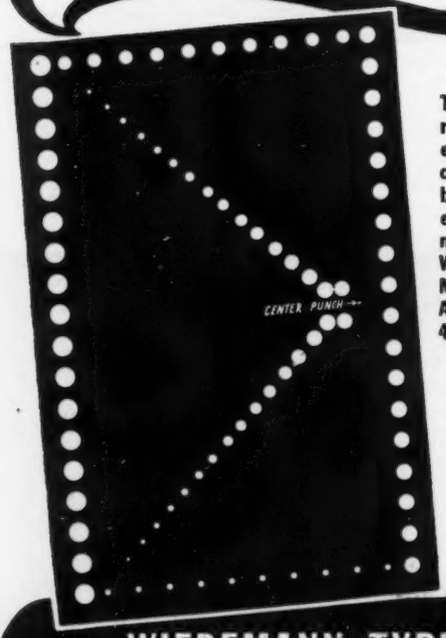
A MASTER TEMPLATE ACCURATE TO ±.002" IN 41 MINUTES!



Template 19" x 36" requiring 17 different round dies and center punch made by a leading radio-electronic equipment manufacturer on Wiedemann Type R-43 Micro Turret Punch. A total of 89 holes in 41 minutes.

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Only with a Wiedemann Micro Turret Punch Press will you get such speed—such accuracy—and such ease of operation. No preliminary layout; every hole is clean, accurate to ± .002"; equipped with center punch for accurately locating extremely small or very large holes.

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No need to tie up your tool room for 8 to 10 hours on a job like this. Write today for the facts about Wiedemann Turret Punch Presses—from 8 to 80 tons capacity.

WIEDEMANN MACHINE COMPANY
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Type R-43 Micro Turret Punch—one of a complete line of production equipment for low cost, small run piercing operations. The method and results are superior.

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Here's 100 tons of smooth, flexible *fluid power* for a wide range of production-line or small-lot pressing jobs. It's Denison's new DLOS2-100, the latest addition to the popular line of standard HydrOILic presses. Smooth, accurate, oil hydraulic operation permits infinite variations in power, speed and control . . . provides for ready adjustment to widely varying requirements. Compact, space-saving, projection-free design makes fast, efficient operation possible with full safety. The DLOS2-100 has a maximum stroke of 18 inches: maximum daylight opening is 36 inches. Available with either a guided platen or a threaded ram, and with manual or electric control. Easily adapted to many special requirements. Write for details or call your Denison representative.

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Your CUTTING JOBS are Different?

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Take just a moment to check off these "variables" to see where your cutting fits in.

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COSTS? Great savings by using **CAMPBELLS.**

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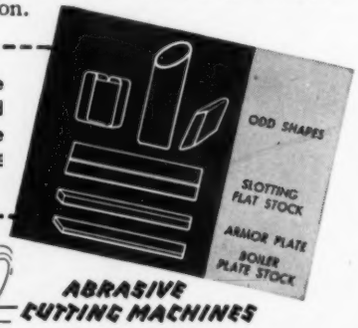
Ask to have a Campbell engineer show you what you can gain by using a **CAMPBELL ABRASIVE CUTTING MACHINE.** No obligation.

• Some of the different shapes and materials cut on **one CAMPBELL ABRASIVE CUTTING MACHINE**



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12" STROKE

SELF-CONTAINED MOTOR DRIVE

power rapid transverse feeds in all directions

Timken Tapered Roller Bearings for Main Spindle—all others anti-friction.

Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

Ask for Circular 726

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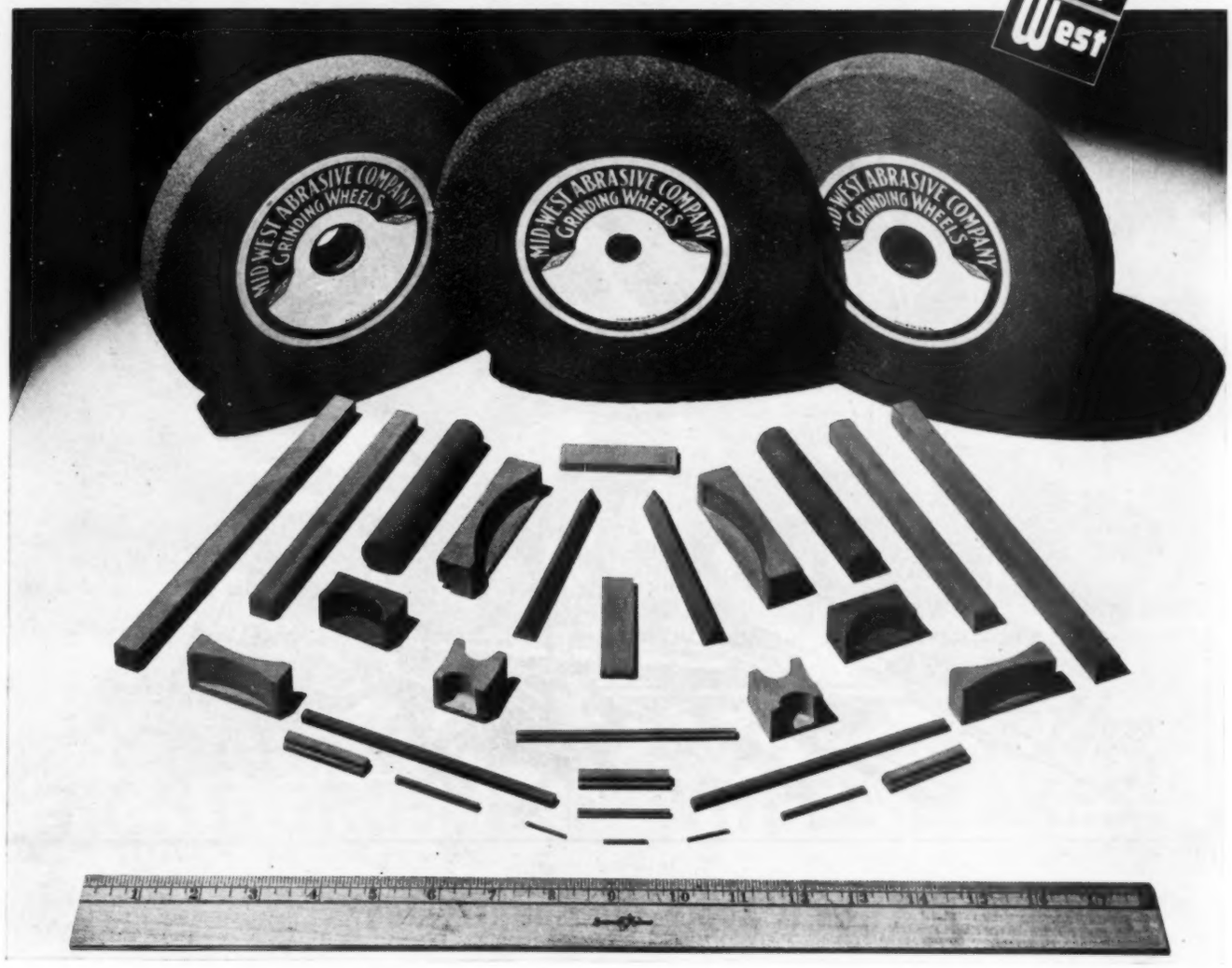
"EFFECTIVITY" Mid-West ..



You won't find "effectivity" in your dictionary but you will find lots of it in MID-WEST honing stones and grinding wheels because we coined the word to describe the longer, more effective wearing quality that has made MID-WEST products the most efficient abrasives in America.

MID-WEST honing and Superfinishing stones, in actual production, have established new records for *efficiency*, *service* and *economy* and all three of those factors are derivatives of "effectivity." MID-WEST stones have longer "effectivity" because they wear down evenly, don't chip along the edges and generate as much as 90 per cent less heat than do ordinary abrasives. These high quality stones, made with remarkable new Micro Bond and designed for *precision* work, are produced under a *precision* process during which the grain structure, hardness, size, shape and balance are CONTROLLED to the final degree. Why not let a MID-WEST engineer help you solve your honing problems? Samples shipped from stock immediately.

MID-WEST ABRASIVE COMPANY

Manufacturers of grinding wheels, sandpaper and emery cloth

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MID-WEST ABRASIVES

He'll Comb the Countryside

Your local industrial distributor runs a business normally based on immediate service from stock. Despite present restrictions, he still is allowed to stock available items, because his stock acts as a central stores department for *all local plants.* He is set up to make the promptest possible deliveries to you.

He expects emergencies and accepts them as one way of proving his usefulness to you. He will comb the countryside to get you what you need to keep wheels turning if he doesn't have it in stock.

He is actively searching for surplus tools, supplies and materials which can be put to immediate use—he knows the inside of every local plant.

He is trying to anticipate your requirements—his preferred reply to any request is "We're sending it over right now!"

He'll help you find alternate items if the exact items you want aren't to be had anywhere.

He's an expert at supplying, just as you're an expert in manufacturing.

He's the short cut between you and your requirements for tools, materials and supplies.

He's on the job to get more production, sooner—USE HIM!

Published in the interest of industrial distributors by

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SINCE 1911, THE ONLY MAGAZINE SERVING INDUSTRIAL DISTRIBUTORS AND THEIR SALESMEN EXCLUSIVELY.

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ONE worker turns out ten units while another man grinds but three! Both are skilled employees but one, for some reason, works faster! Right now, for the sake of early victory, it is important that the reason be found quickly! Could it be the grinding wheels?

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THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
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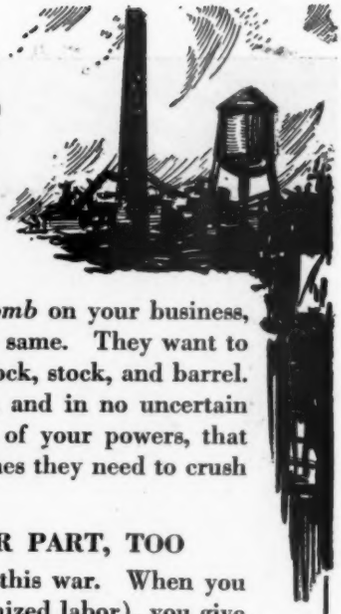
THE WHEELS OF INDUSTRY



TARGET FOR TONIGHT

...*Your Business?*

Maybe they won't actually come and drop a *bomb* on your business, but the Axis war lords have their eye on it, just the same. They want to wipe it out as a competitive force—or take it over lock, stock, and barrel. Here is a threat that you can reply to *now*, today, and in no uncertain terms—by buying Defense Bonds to the very limit of your powers, that our armed forces may have the guns, tanks, and planes they need to crush the Axis *once and for all.*

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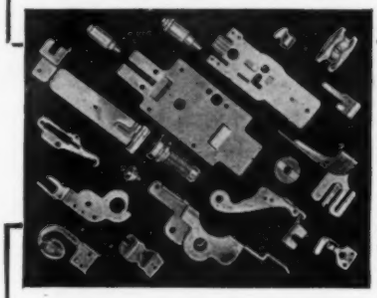

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Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x6" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
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SEARCHLIGHT SECTION

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These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

DESIGNING ENGINEER and detail draftsmen. Must have experience in either heavy machinery or structural design. P-248, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

MECHANIC THOROUGHLY EXPERIENCED in manufacture of instruments. Must be U. S. Citizen. All defense work. Excellent chance for advancement in old well established company. State age and experience in full in first letter to get recognition. Location near Philadelphia. P-256, American Machinist, 330 W. 42nd St., New York, N. Y.

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MACHINE TOOL DESIGNER

One of the finest equipped plants in the Metropolitan District requires a machine tool designer of the highest type; one who has proven ability in creative work and initiative. This is a rare opportunity for the right man. No letter considered that does not give complete details of background.

P-240, American Machinist
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WANTED

PRODUCTION EXPERT

A manufacturing concern located 40 miles from Chicago has large defense contracts for production of shells, small arms, and other close-tolerance items.

Wanted—A production expert qualified by experience to estimate costs, plan processing and supervise manufacturing. Write immediately, specifying experience and qualifications. All responses held strictly confidential. Attractive salary.

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Address_____
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WANTED
Machine Shop Foreman

Man experienced in operation of medium and heavy machines and fitting work. Permanent position with opportunity for advancement. Location, Pittsburgh.

Give description of experience and starting salary. Write

P-252, American Machinist
330 West 42nd St., New York City

POSITIONS VACANT

APPRAISER OF INDUSTRIAL PROPERTIES; Permanent position open with group of New England fire insurance companies. Applicant with previous experience preferable, but engineer or technical man with proper background, such as knowledge of machinery and some building construction, might be acceptable for further training. Send photo with letter. P-258, American Machinist, 330 W. 42nd St., New York City.

DESIGNING ENGINEER in Metropolitan New York Area, Capable of drafting own plans and building automatic machines. Thoroughly familiar with operation of all machine tools and able to take complete charge of production. Give full experience and salary expected. P-257, American Machinist, 330 W. 42nd St., New York, N. Y.

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CONSULTING INDUSTRIAL and Production Engineer who was general superintendent of a plant manufacturing munitions during the world war, and is still conducting manufacturing operations, will consider new connections either in a consulting or executive capacity. Experienced in the construction, outfitting, tooling and operation of medium sized plants in the metal working industries. Address Engineer, 27 Manchester Rd., Poughkeepsie, N. Y

SPRAYER—15 years experience as foreman with all types of spray guns. Will work anywhere in New York State. PW-251, American Machinist, 330 W. 42nd St., New York, N. Y.

INDUSTRIAL ENGINEER, employed, with comprehensive management and production experience, metal products, desires permanent position. University graduate. Married. PW-250, American Machinist, 330 W. 42nd St., New York, N. Y.

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WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on the page Facing the inside back cover.

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Complete Plan Preparation—Specifications
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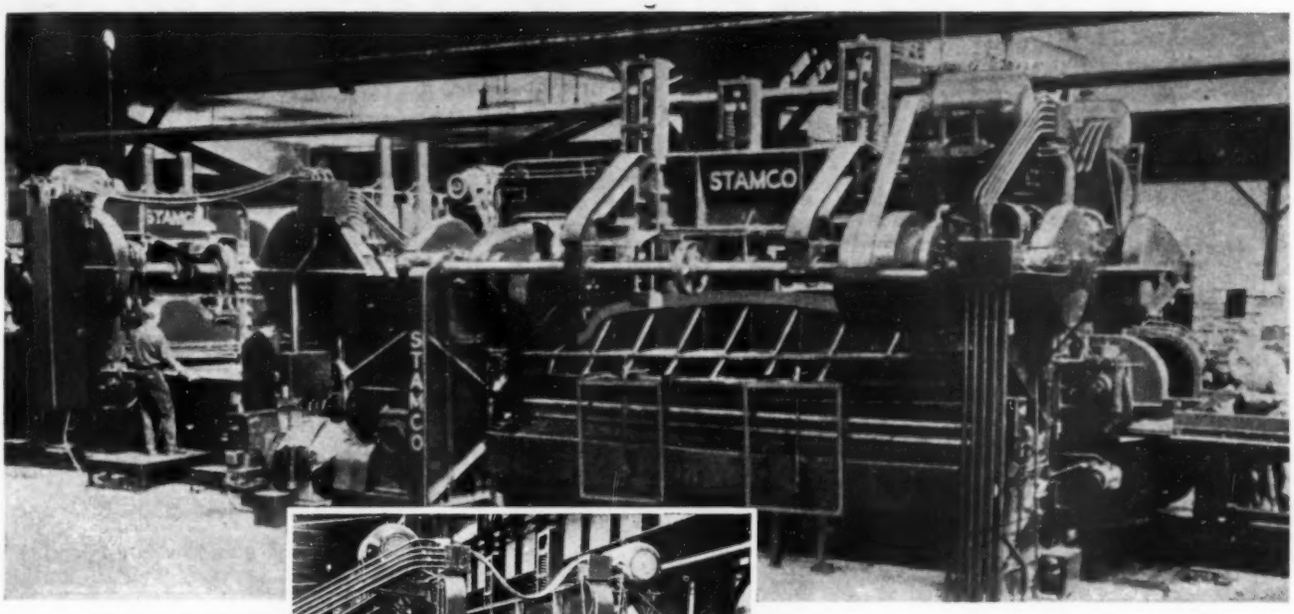


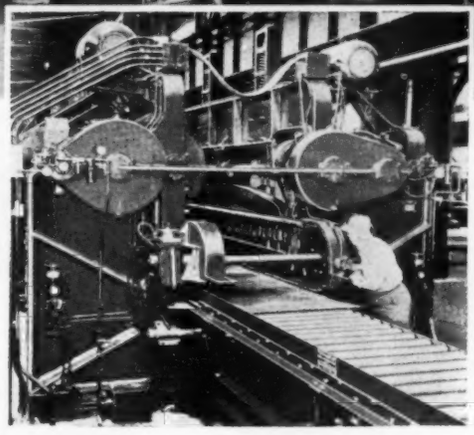
STAMCO SHEARS

PRODUCTION:

We guarantee that this machine will cut on all four sides 8 to 10 sheets or packs 12 feet long per minute or the equivalent in other lengths. The resquaring unit will shear square and without camber according to accepted commercial standards and to exact size with 1-16" in width and 1-16" in length.

OVERALL DIMENSIONS:

Above the floor, 13' 3"
Below the floor, 1' 6"
Length Overall, 45'
Weight of the machine with approximate weight of machine with 170" length blade by 74" width blade, 208,000 lbs.



• LEFT ENTRY END OF SHEARS

CAPACITY

Full pickle finished sheets, 3/8 and lighter
Length of side cut knives, 250" maximum
Length of end cut knives, to suit requirements
Minimum width sheet, 24"
Maximum length sheet, 240"
Minimum length sheet, 54"
Maximum width sheet, to suit requirements
Conveyor speed, 200 ft. per minute
Height of Feed Table, 30"

PACK AND RESQUARING UNITS

ADJUSTMENT OF LENGTH AND WIDTH

Through electric motors, push buttons located near operator. Motors connected to large screws. No bolts or nuts to loosen to make adjustment for size of sheet to be sheared. Approximate time for change over on size of sheet is 5 minutes. Automatic stop set handy so any operator can stop machine.

Ready for Immediate Shipment At a Great Saving in Cost

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FALK MACHINERY COMPANY

MACHINERY MERCHANTS

18 WARD ST., ROCHESTER, N.Y.

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"FALK" REBUILT MACHINERY

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GRINDERS—Cylindrical

20"x120" LANDIS self contained, Motor dr.
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14' SOUTHWARK BENDING ROLL

$\frac{5}{8}$" Plate capacity, motor driven, drop end housing, intermediate support, cast iron base, power raise and lower to forming roll. Immediate delivery. Bargain.

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Gardner #8-40" disc, 30" Ring Wheel, B.B. belt Dr.
Gardner #4-20" Disc, 16" Ring Wheel, B.B. Belt Dr.
Badger #2-16" Disc, Double End, Univ. Tables, Belt.
Gardner #1—double end Disc, 12", B.B. belt dr.
GARDNER #14, Ball Bearing, double opposed, 20" discs.

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15" HENDEY, Friction Drive, (5) $450 ea.
20" CINCINNATI, Geared, Crank, complete. Motorized.
25" Stockbridge, Geared, Crank, Heavy. Cone dr.
15" Smith & Mills, single Geared, Crank, cone dr.
12" Gould & Eberhard Back Geared, crank, cone dr.
7" Rhodes combination Shaper and Slotter, belt dr.
20"x20"x24" N*B*P SHAPER-PLANER, Motor Drive;
10" NEW HAVEN SLOTTER, very fine condition 30" Rotary Table.
12" New Haven Slotter; 32" Rotary Table.

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18"x10' REED Pl. Change Gear, Screw Cutting, Complete with Chuck.
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7"x36" PRECISION BENCH LATHES — Hardinge, Sloan & Chase and others.
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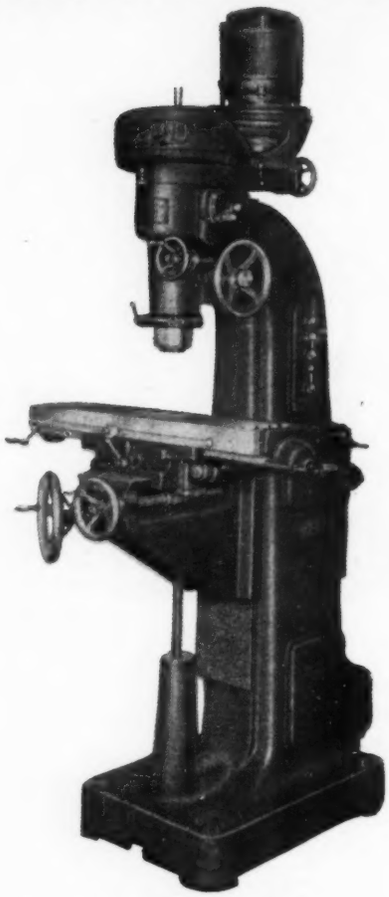
16"x10' REED-PRENTICE Quick Change, cone dr.
18"x12' HAMILTON pl. Change, Cone dr. chuck.
11"x4' PRATT & WHITNEY TOOLMAKERS LATHE, Taper att.
16"x6' SOUTH BEND pl. Chge, Screw Cutting Engine Lathes (2)



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cap. 18" longit. feed
8½" cross travel
16" Vertical travel
table working surface 8"x32"

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AMERICAN 5' Arm, semi Universal, 12" col., arr. Motor drive.
DRESES 3' Arm, Plain Radial, Motorized; REBUILT-READY TO GO.
DRESES 4' Arm Plain Radial, cone dr.

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#7H Becker Lincoln Type Production Miller
#12 Pratt & Whitney Lincoln Production Miller
#2 Pratt & Whitney Lincoln Production Mill
#2 Kempsmith Lincoln Production Mill
#2 GARVIN DUPLEX PRODUCTION MILL
#12 PRATT & WHITNEY DUPLEX PRODUCTION MILL

DIE CASTING MACHINES

3—MADISON-KIPP late model, 10" x 12", 12" x 14", 12" x 16"

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#18 Bliss OBI
#19 Bliss OBI (4)
#19 Truesdale OBI
#4 Adriance OBI
#19C Bliss OBI
#18C BLISS OBL
#4 MICHIGAN OBI
#20B BLISS OBI
#4 V & O—OBI
#6 Waterbury Back Geared, Open Back, Inclined Legs.
#73½ BLISS S.S. Plain flywheel.
#4 BLISS Back Flywheel Plain.
#4 Bliss Back Flywheel Geared.
#2 BLISS Back Flywheel Plain (6)
#1—Bliss Back Flywheel Plain.
#3R—Marquette Geared, Motor Dr.
#15N BLISS, arr. Geared Motor dr. (2)
#25N BLISS Geared, Motor dr; (3)
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#1½ BLISS S.S. DBLE ACT. CAM PRESS.
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25 Ton Henry & Wright High Speed Press, dble roll feeds
#103S BLISS GANG DIE PRESS; Roll Feed
#4½ BLISS three column Forging Press with Taper Rails
6 Ton General Flexible Press
12 Ton Fox Flexible Press
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#75 Toledo Open Back Plain Flywheel Press
#16 Bliss Horn Press, 3" stroke, Motor Driven
#2 Niagara OBL; #0 V & O (3)
#3 American Can Co OBI
#53 Perkins Sprue Cutter
#2 Middleditch Spruce Cutter
SHERIDAN EMBOSSING PRESS, 24x36
#1-#100 Standard Automatic Drop Hammer
#702 BLISS TRIMMING PRESSES (2) Flat
#4 Waterbury open back, rigid bed, plain
520 Ton Southwark Hydraulic with Laurie Pump

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Every Item Guaranteed

FALK MACHINERY

MACHINERY

18 WARD STREET

DEPENDABLE MACHINES

"FALK" REBUILT MACHINERY

WIRE, WRITE OR PHONE

AUTOMATIC CHUCKING MACHINES

2—#24 New Britain type 5 spindle
1—#23 New Britain type 5 spindle
1—J&L HARTNESS AUTOMATIC CHUCKING LATHE; motor driven

42" BRIDGEPORT VERTICAL BORING MILL
2 Heads on Cross Rail

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#2 WHITON SPUR GEAR CUTTER, Auto
36" Gould & Eberhard "Victoria Model" perfect Cond.
48" Gould & Eberhard, Motor Driven; Complete; Perfect Cond.
#36B Gould & Eberhard Spur and Bevel Gear Cutter, Motor Dr.
#0 #1 #2 #3 STANDARD AUTOMATIC GEAR CUTTERS, BILTONS

HAMMOND 10 H.P. BUFFERS—8 months old. (3) Motors in base, 3-60-220/440 v.

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#14 PRATT & WHITNEY double spindle, Geared Spindles
#14 PRATT & WHITNEY double Spindle, Belted Spindles, self contained counter
#2 GARVIN SINGLE SPINDLE PROFILER, Belt dr.

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WICKES COMBINATION PUNCH AND SHEAR; MOTOR DRIVEN; 1¼" thru 1" Plate; Punching end 48" throat; Shearing end 36" throat; Continuous 6"x1" Plate
LONG & ALLSTATER #2—24" Throat, arr. motor dr. Capacity 1" thru 1"
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36" x 16 ga. Foot Shear
Pexto 48" x 16 ga. Foot Shear
Pittsburgh 36" x ¾" Plate Shear, no holddown
UNITED ENGINEERING PLATE SHEAR 42" x 3/16 no holddown
MESTA ENGINEERING Plate Shear 42" x ⅜ Plate, Motor dr.
#216 NIAGARA RING AND CIRCLE SHEAR, Motor Dr.
#132 BLISS 14 ga. 12" throat, Slitter
#236 PEXTO CIRCLE SHEAR, SPD.; 16 ga.
#232 Bliss 12 ga. 18" throat, Slitter
12' x ⅜ and 6'x⅜ STAMCO MILL PACK SHEAR, complete
BLISS 24" x 16 ga. POWER SHEAR—Perfect for Tin Plate

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#1 and #2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½ cap. last used for Speedometer cable. Complete with motors

KEYSEATER

#3½ BAKER 72" x 3" Capacity, immediate delivery.

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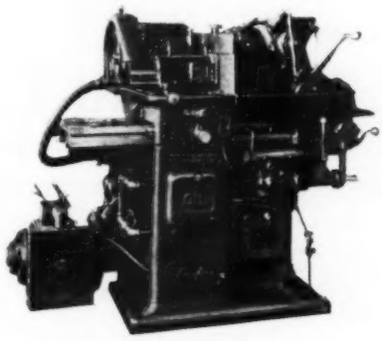
#3 Warner & Swasey Plain 3 step cone drive; Plain Hand feet to turret; Hand cross slide, front and back tool posts, 6 hole round turret. Will take 1¼ bar stock but without Bar Feed; Counte.shaft drive; single stop on turret Ram; Bargain

INTERNAL GRINDER



GREENFIELD #12, HYDRAULIC FEED

Motor Drive; Cap. swings 15"; Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928—looks good as new.

SPECIAL****
VERTICAL ROTARY SURFACE GRINDER

COVELL-HANCHETT #940 Capacity 40"; takes 12" Wheel; MOTOR DRIVEN, Ball Bearing throughout. Perfect condition. Immediate delivery—Cost $10,100. Sale price $6000.00.

TURRET LATHE

GISHOLT 24"x6¼" hole thru spindle Universal, Taper attach. Chuck, Tooling. Motor dr. perfect condition, immediate delivery. Rare bargain.

BETTS HORIZONTAL BORING MILL

Knee type boring mill; 5" bar, 48" x 60" table, arranged for motor drive. Equipped with two additional boring bars—Price $8,500.

DRILL PRESSES HIGH SPEED, BALL BEARING

Sliding Head; Screw El. Tables

4 Spindle Foote-Burt High Speed Ball Bearing with power feed to each spindle automatic quick return, tight and loose pulley drive; 8" overhang #2 Morse Taper; table working surface 14" x 48"
1 Spindle Avey #3, 12" Overhang, #3 M.T. with Power feed; Ball Bearing
1 Spindle Avey #2, 8" Overhang, #2 M.T. with Power Feed; Ball Bearing
2 Spindle Avey #2, 8" Overhang, #2 M.T. Plain Hand Feed; Ball Bearing
3 Spindle Avey #2, 8" Overhang, #2 M.T.
2 Spindle Leland Gifford #2 M.T. 10" Overhang, Power feed to one Spindle
2 Spindle KERN #2 M.T. 8" Overhang
2 Spindle Henry & Wright, 8" Overhang, #2 M.T.
1 Spindle EDLUND #2B, 8" Overhang, #2 M.T.
1 SPINDLE ALLEN #2 M.T. 8" Overhang
1 Spindle FOSDICK with TAPPING MECHANISM ON SPINDLE, #2 M.T. 8" overhang
1 Spindle KOKOMO #3, 12" Overhang, Quick Change Gear box; #3 M.T.
1 Spindle Henry & Wright 8" Overhang, #2 M.T.
15" BUFFALO Motor Driven ⅛" Cap. Drills, NEW from stock
18" BUFFALO NEW DRILLS, 1" Cap. Motor Driven, from Stock
10" BURKE BENCH DRILLS—many in stock
7 Spindle Sigourney Gang Sensitive Drill #2 M.T. 7½" Overhang
3 Spindle ROCKFORD Plain 20" Drill Press Power Feed back Geared
24" CINCINNATI UPRIGHT HEAVY DUTY DRILL PRESS, #4 M.T.
28" SNYDER UPRIGHT HEAVY DUTY DRILL PRESS, BACK GEARED POWER FEED
36" SNYDER UPRIGHT HEAVY DUTY DRILL PRESS, BACK GEARED POWER FEED
#220 BAKER TWO SPINDLE HEAVY DUTY PRODUCTION DRILL WITH INDEX TABLE FITTED WITH THREE 8" QUICK ACTING CHUCKS; #5 M.T. Arr. M.D.
21" FOOT-BURT UPRIGHT DRILL PRESS WITH HIGH COLUMN. 18" SPINDLE TRAVEL #4 M.T. arr. Motor drive

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WE SELL DREIS & KRUMP "CHICAGO" PRESS BRAKES AND BENDING BRAKES; STREINE POWER SQUARING SHEARS; BUFFALO DRILLS AND IRON WORKERS; CLEVELAND MILLING MACHINES; INDEX UNIVERSAL VERTICAL MILLERS; TROYKE ROTARY TABLES; L-W LATHE CHUCKS; INDEX HEADS; MAGNETIC CHUCKS AND HACK SAWS; VISES OSWEGO MACHINISTS BENCH VISES; B-LINE MOTORS; VALLEY ELECTRIC GRINDERS; INQUIRIES INVITED.

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AUTOMATICS
1¾" Gridley, four spindle
1¼" Gridley, four spindle

BROACHES
No. 3 LaPointe
No. 4 LaPointe
No. 4 Oilgear Hydraulic

DRILLS
5' Western Radial
No. 17 Foote Burt
No. 1 Bausch, 8 spindle

GEAR CUTTERS
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
18" Gleason Gear Tester
No. 5A Lees-Bradner Gear Generator
No. 10 Lees Brander Gear Grinder
No. 6 Fellows Gear Shaper

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6"x18" Landis Cylindrical
12"x42" Landis Cylindrical
16"x50" Norton Crankshaft
No. 55 Heald Internal
No. 60 Heald Internal
No. 2 Diamond Surface
No. 24-53" Gardner Disc

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16"x6' Lodge & Shipley, c.d.
16"x14' South Bend, m.d.
18"x8' Lodge & Shipley, c.d.
3½"x60" Fitchburg Lo-Swing, g.h.
20"x8' Wickes Production, c.d.

TURRET LATHES
No. 6A Potter & Johnston
No. 2A Warner & Swasey
No. 6 Warner & Swasey, c.d.
No. 4 Warner & Swasey, c.d.
No. 2 Warner & Swasey, c.d.
No. 1 Warner & Swasey, c.d.
11"x4' Greenfield, c.d.
No. 7 Foster, c.d.
3½"x36" Acme, g.h.
3"x36" Jones & Lamson, g.h.
3"x36" Jones & Lamson Double Spindle, g.h.
2¼x24" Jones & Lamson, g.h.

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2½" Cleveland Horizontal, s.p.d.

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No. 2 Rockford, c.d.
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No. 4 Hendey, Lincoln Type
No. 2 Kent-Owens, m.d.
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26"x26"x8' Gray
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No. 2X Garvin
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GEAR CUTTERS
No. 4—48" Brown & Sharpe

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Hill-Clarke Production Universal
12x36 12x50 12x72
(See page 152 special advertisement Hill-Clarke Cylindrical Grinders)
No. 40 Bryant Plain, Wide Wheel, Oscillating
No. 10 Lees-Bradner Spur Gear Grinder
No. 5 Springfield Planer Type Surface
1½" dia. New Yankee Drill Grinder

LATHES
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26"x10' Bridgeford
30"x12' Whitcomb-Blaisdell

PLANERS
24"x24"x12' Cray
36"x36"x8' Cincinnati

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No. 42½ Pels Beam Shear

SHAPER
20" Gould & Eberhardt

MISCELLANEOUS
No. 11 Cochrane-Bly Saw Sharpener
60" Quickwork Rotary Shear
No. 3-B J. N. Lapointe Broach
No. 4 J. N. Lapointe Broach
6" Saunders Pipe Machine
No. 12 Bignall & Keeler Pipe Machine
No. 4 Gaterman Tapper

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651 W. WASHINGTON BLVD. CHICAGO

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9"x18" Porter Cable Lathes (2)
No. 324 Adriance Spinning
26"x10' LeBlond, Universal Crankshaft
MILLING MACHINES
2" Pratt & Whitney spline (duplex) (Double)
No. 2B Milwaukee Plain
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Goss & De Leeuw Chucking, 6"x6½"
GEAR MACHINERY
No. 4—48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinders (2)
MISCELLANEOUS
No. 2 & 6" Campbell Nibblers
No. 3 Rivett Internal Grinder
20 KVA. Taylor Spot Welders
3' Carleton Radial Drill
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8" Welland Standard Pipe Machine
No. 4 Hilles & Jones Double End Punch and Shear
No. 303 Bliss St. Side Gd. M.D.
No. 225 Adriance Press
No. 3 Adriance Inc. Press
No. 23 Stoel Herring Press
No. 4 Chas. Loeffler Inc. Press
2" Acme Bolt Threader
No. 1 Baker Keyseater
No. 4 Garvin Profiler
No. 80 Grant Rivet Spinner
1¼" Hartford Automatic Screw Machine
No. 2 Garvin Tapper M.D.

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UNUSUAL VALUES
Shapers: 24" G&E.
28"x20'6" Rahn-Carpenter Lathe 14' between centers
12"x6' Seneca Falls lathe, loose change gear.
15"x8' South Bend, loose change
16"x8' South Bend, loose change
18"x8' Champion, quick change
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2 50# Bradley upright hammers, m.d. like new
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300 other machinery items
Rock River ⅞" capacity punch and shear
MOTORS—new 5 H.P. for 3-phase, ball brg.
Also rebuilt motors.
THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

AUTOMATICS, 1¼" Cleveland Model B.

GRINDERS, #2 Churchill Internal, can grind 30" deep, dist. center of spin. to top of table 18", M.D.; 30" x 240" Landis Cylinder; 24" x 96" Landis Cylinder.

GEAR CUTTERS, 96" x 16" & 60" x 12" Gould & Eberhardt Spur (2); 11" Gleason Bevel Gear Generators (2).

KEYSEATERS, #3 Baker; #4 Mitts & Merrill; #6 Catlin, 40" stroke x 5" wide; #1 Davis.

DUPLEX MILLER, #3 Garvin, table 12" x 64", 60" feed, gear box, AC, M.D. June delivery.

LATHES, 18" x 10' L. & S. Grd. Hd. T.A. M.D., 21" x 12' Ryerson Conradson Grd. Hd., taper attachment, M.D.

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No. 66 Dietrich & Harvey Floor-type Boring Mill; 3 7/16" bar; 10x10 floor plate; outboard support; tilting table.
34" Gisholt Turret Lathe; 6¼" hole in spindle; rapid traverse; taper attachment.
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8x18 Cincinnati cylindrical grinder; md
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18" Gould & Eberhardt Gear Hobber; spdr.
30x30x8' American Planer; two rail heads.

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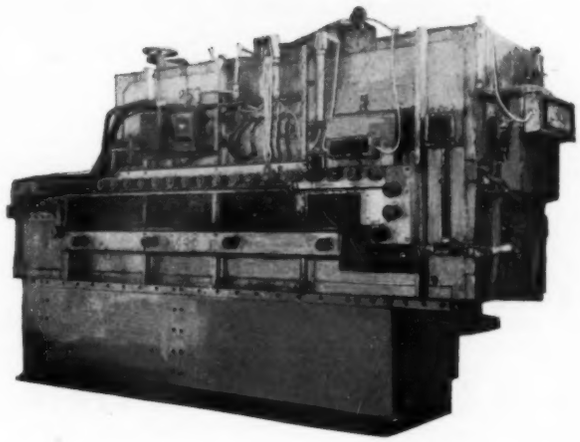

1—TYPE HD-81912 HEVI DUTY ROLLER HEARTH ELECTRIC FUFRNACE

Chamber 11′ wide, 12″ high, 19′ long

Loading and discharge openings 11″ wide, 12″ high

The hearth is of driven roller type, rolls are 1½″ dia. 9″ wide, and 6″ centers

Loading End: 1850 deg. F. Temperature, 68 volts max., 10.5 max. KW

Discharge end: 1850 deg. F. temp., 230 volts 69 KW

Furnace is 20′ 6″ long, 24′ 10″ overall, 6′ high, 63″ wide, weight about 22000#

Note: Interior of furnace has been completely rebuilt with new refractories and heating elements. Nichrome steel shafts in the fuurnace to withstand high temperature.

1—HEVI DUTY TYPE HD-18918 ROLLER HEARTH CONTINUOUS FURNACE

Chamber loading space—20″ wide x 18″ high x 10′ 0″ long

Three zones of temperature control provided 1850 Deg. max. operating temp.

The hearth is of the driven roller type.

These rolls are used for conveying work thru the heating chamber in a continuous movement.

3—HEVI DUTY TYPE HD-1842 VERTICAL RETORT FURNACE

The fan is essentially used to cause a breakdown of the gases and cause circulation thruout the charge in the retort. The retort is removable for cooling of parts outside of the furnace if desired.

Work space inside retort—approx. 18″ dia. x 42″ deep.

This furnace may also be used for nitriding, hardening with controlled atmospheres, annealing, etc., where ever a closed retort is desired.

Total furnace rating—60 KW on 230 V, 3 phase.

Two zones of temperature control provided.

1850 Deg. F. max. operating temperature.

2—HEVI DUTY 5 POT TINNING FURNACE

Dimension of pots:

#1—24″ wide x 40″ long x 24″ deep
#2—24″ wide x 20″ long x 24″ deep
#3—24″ wide x 20″ long x 24″ deep
#4—24″ wide x 20″ long x 24″ deep
#5— 8″ wide x 24″ long x 4″ deep

Overall dimensions approx. 5′ wide x 15′ long x 3′ high

4 zones of temperature control provided

Pots are of cast iron, max. operating temperature approx. 800 deg. F.

Individual insulated covers provided for all pots

Total rating of furnace 120 KW, 220 V, 3 Phase.

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BEAUDRY "CHAMPION"
Two (2)—500 lb. size.
One (1)—400 lb. size.
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DRILL, Radial 4½′ American, T.A.M.D.
GEAR CUTTERS, Spur, 30″, 36″ & 40″, M.D.
GEAR PLANERS, Bevel, 36″ & 54″ Gleason, M.D.
GRINDER, 18″ x 30″ x 96″ Norton Cyl., M.D.
LATHE, Geared Head, 27″ x 11′ LeBlond, Hvy Duty
SLOTTER, 15″ Dill, & 8″ Betts, M.D.
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20" Throat No. O H & J Single End
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60" Throat A-250 L & A Single End
48" Throat No. 8 SOUTHWARK Single End
20" Throat E. F. CLEVELAND Double End
36" Throat No. 3 SOUTHWARK Double End
24" Throat No. 4 L & A Double End
No. 3 H & J Open Throat Bar Shear
R.T. — 40 SCHULTZE-NAUMANN Beam Shear, 15 HP. motor
No. 6 BUFFALO Diagonal Bar Cutter
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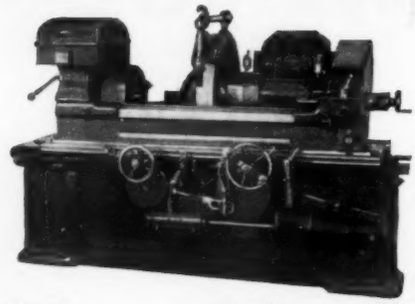

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10 x 36	14 x 36	14 x 96
10 x 50	14 x 50	16 x 50
10 x 72	14 x 72	16 x 72

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52" x 14' New Haven Lathe
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38" x 18' Prentice Geared Head Lathe
2¼, 3¼ and 4¼ Gridley automatics
42" Bullard vertical boring mill, M. D.
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16" x 54" Norton grinder
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36" Fellows Gear Shaper

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48"x12" Gould & Eberhardt Gear Cutters (2)
48" Brown & Sharpe Gear Cutter
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3—Hendey Lincoln Type Millers
24" Aurora Drill.
2—24" Vert. Turrets.

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800# B & S Board Drop Hammer
Centering Mach. Whiton 15"x48".
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Bolt Cutters 1"x1½"-2"-3"-4" Acme.
2" P&W Double Spline Miller, B.D.
4' Bickford Radial Drill.
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42"x20' N.H. Grd. Head Lathe M.D
No. 2 Baker Keyseater, 2"x20".

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1—10' Vertical, 2 heads on cross rail

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Lipe 2 spindle chamfer
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8"x10" No. 1 **Lees Bradner** production hobber
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18" **Gleason** straight bevel gear generator
26"x8" **Brown & Sharpe** automatic spur
36"x6" **Gould & Eberhardt** spur gear cutter
48"x10" **Brown & Sharpe** automatic spur

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10"x10" **Landis** hydraulic
10"x24" & 12"x36" **Landis**
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18" No. 2 **Gardner** disc
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18" **Gardner** semi automatic disc
24", No. 84 **Gardner** opposed disc
24", No. 221 **Hanchett** opposed disc
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Gisholt tool grinder
24" **Ingersoll** cutter
17"x36"-48" **Norton** hydraulic crank
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500 lb. **Bradley** helve
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No. 3½ **Fox** hand
No. 12 **Brown & Sharpe Mfg.**
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Hall planetary thread, type C,
No. 5C **Lees Bradner** thread
Nos. 1 & 1½ **Knight** vertical
Type AB **Becker** vertical
25"x25"x14' **Ingersoll** stab
Nos. 1 & 1A **Davis & Thompson** drum type duplex
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24"x24"x5' **Gray**
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750 ton **Baldwin Southwark** triple action hydraulically operated toggle drawing press. Between uprights 11'-10½", shut height 84", strokes 37", 26" and 12". Weight 500,000 lbs.
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40 ton No. 6 series A **Waterbury Farrel** openback non-inclinable, 1½" stroke.
28", No. 71 **Swaine** double crank, 3" crank, 1" stroke
No. 4 **Massillon** straight side, geared, 5" stroke, 9650 lbs.
No. 7 **Rockford** straight side, geared, 3¾" stroke, 9000 lbs.
No. 8-7 **Zeh & Hahnemann** straight side, geared, 2¾" stroke, 6000 lbs.
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20 ton **General Flexible** Nos. 201 and 203.
12 ton **Fox** No. 24 Superflex
8 ton **General Flexible** No. 83
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1½"x1" 12" throat **Cleveland** horizontal
1¼"x1", No. 1½ **Long & Allstatter,** 12" throat
⅜"x⅜", 26" throat **Rock River**
No. 54 **Hendley & Whittemore** comb. punch & shear

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54" **McKay** 17 roll straightener
No. 1A **Ajax** taper forging
3/16"x4" **Bay City** bending roll

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3/16"x24" No. 1B **Campbell** nibbler
Pels beam shear
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Lewis alligator shear
⅜"x3' & 5' **Shuster** wire machine
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Many **Butt & Spot** welders
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LAPPER, Norton #15 Vertical, M.D.
MILLING MACHINE, Lees-Bradner #3 Thread
PLANERS, 44x44x18' Niles 4 heads
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4" Williams Pipe Machine.
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62" Poole Vertical Boring Mill S.P. Drive Grd. feeds
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92D Toledo Dbl. Crank Press
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- CRAFTSMAN No. 2 Rotary Miller
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- COULTER 2 spindle Diamond Borer—M.D.
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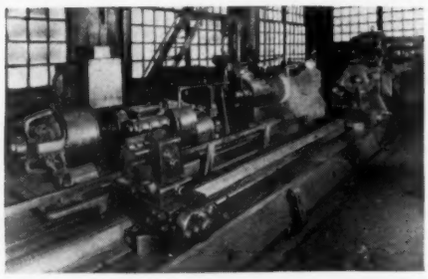

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NEW ADVERTISEMENTS received by 10 A.M., June 2nd will appear in the issue of June 11th, subject to limitations of space available.

FOR SALE

Rebuilt by Mach. Tool Mfg.

#2 Rockford Plain Milling Mach.—Single Pulley Drive. Motor Driven.
#2½ Rockford Plain Milling Machine M. D.
#3 Kempsmith Plain Milling Machine M. D.
#3B B & S H. D. Plain Milling Machine Single Pulley Drive. M. D.
#3 LeBlonde Plain Milling Machine M. D.
#4 LeBlonde Plain Milling Machine M. D.
#55 Heald Internal Grinder M. D.
#9 8' Dries & Krump Hand Brake.

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36" x 14' Niles Tool Works Planer, 1 Hd. on rail, a genuine bargain.

20" Foote-Burt High Duty Drilling Machine, 2½" capacity, S.P.D. and 3 HP motor on bracket table 20"x16".

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With Feed Screw Inserted

8" X 18'
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4½" X 12'

EXCELLENT CONDITION

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Arranged for Belted Motor Drive

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Youngstown, Ohio

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Table Speed: 28 R.P.M. Table Diameter: 36" Double Face ½" Groove. Louis Allis 3 H.P.—220/440 Volt, 3 Phase, 60 Cycle, Ball Bearing. Westinghouse Push Button Start-Stop Line-starter. Price—$1,425.00.

McCulloch Engineering Company
3420 W. Capitol Drive
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New "SEARCHLIGHT" Advertisements

Received by 10 A. M. Tuesday will appear in the issue out Thursday of the following week, subject to limitations of space available.

Departmental Staff
AMERICAN MACHINIST
330 W. 42nd St., New York

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We can rebuild them and modernize them for today's tasks at our new rebuilding plant, 432 Bryant Ave., Bronx—WOrth 4-7960. Send us full details—We will be glad to have our engineer inspect them and submit quotation.

PARTIAL LISTING OF MACHINES IN STOCK

Can Be Rebuilt and Motorized to Your Specifications

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BETTS 30"x30"x10' Closed side
CLEVELAND 42"x42"x12' Closed side
D & H 48"x48"x21' Open side

TURRET LATHES:
J & L Hartness sliding head (5)
GREENLEE c.d. (2)
DRAPER 20" axel turning lathe

ENGINE LATHES:
LEBLOND 1¼" cap. adapted for turret
LODGE & DAVIS 1¼" capacity
PUTNAM 24"x16'
MONARCH 18"x8', Q.C. B.G.
LODGE & SHIPLEY 16"x10' geared head
FLATHER 16"x6'
HENDEY 16"x6' Q.C. yoke head
DAVIS FURBER, H.D.

DRILLS:
PUTNAM Vert. 36"
DIAMOND 10" cap.
Comb. drilling, milling & tapping machine, Hor. or Vert.

CYL. GRINDERS:
#3 MODERN Universal (5)

SURF. GRINDER:
14" PRATT & WHITNEY ball bearing

BORING MILLS:
42" BULLARD vertical
84" MILES BEMENT vertical

SHAPERS:
16" GOULD & EBERHARDT (2)
24" CINCINNATI, heavy duty

NORDBERG Diesel Electric power plant, complete, 440 H.P., direct connected to Crocker Wheeler Generator.

Reconstruction Machine Tool Corp.
199 Centre St., New York, N. Y.
WOrth 4-7960

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18" Libby Type A, m.d.
24" Gisholt Model I, tilted turret
24" Gisholt, cross sliding turret
2 spindle 3x36" Jones & Lamson, chucking
3x36" Jones & Lamson, bar
3x36" Jones & Lamson, chucking
3¼x40" Greenlee, bar
Woods Tilted Turret, cone

ENGINE LATHES
13"x6' Willard
15"x6' Willard
16"x8' Greaves-Klusman
18" raised to 28"x10' Reed
18"x12' Barker
20"x10' Pond
21"x12' Bradford
22"x13' Niles
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22"x18' Niles
24"x8'6" Bridgeford
24"x10' Bridgeford
24"x10' Whitcomb-Blaisdell
24"x11' Chard
24"x16' Schumacher-Boye
24"x18' Greaves-Klusman Geared Head
26"x16' Bridgeford
30"x14' Hamilton

RADIAL DRILLS
2½' Avey Sensitive
3' American Sensitive
3' Carlton Sensitive
3½' Mueller Plain
4' Fosdick Plain, gear box
4' Hammond Jack Knife
5' American Plain, gear box
5' Fosdick Plain, m.d.
5½' Niles Semi-Universal
6' Niles Full Universal, gear box

TOOL & CUTTER GRINDERS
No. 3 Brown & Sharpe Cutter & Reamer
No. 4, 5, 31 Oliver Motor Driven Drill Pointers
No. 23 Brown & Sharpe Gear Cutter
Gisholt Universal Tool
Gleason Cutter
Gould & Eberhardt Gear Cutter
Modern Chaser
Yankee Drill

AUTOMATICS
⅜-½" Cleveland Model B, m.d.
4 spindle ⅞" Cleveland Model M, m.d.
⅞" Model A Cleveland
1¼" Cleveland Model A
1¼-1½" Cleveland Model B
1¼" Hartford
No. 6D Potter & Johnston for brake drum work
No. 5A Potter & Johnston

BOLT THREADING MACHINES
9/16" 2 spindle Landis, m.d.
1" 2 spindle Acme, cone
1" 3 spindle Acme, cone
1" Landis, cone
2" Landis, cone
2¼" Acme, cone
No. 11S Rickert-Shafer Auto. Threading Machine, m.d.
1¼" American Bolt Header

BORING MILLS
30" Colburn, 1 turret head
48" Niles Car Wheel Borer, m.d.
5½" Bement Horizontal, m.d.

BROACHING MACHINES
Cincinnati Mill Broach, m.d., new
No. 2 LaPointe of Hudson, belt
No. 2 J. N. LaPointe, m.d.
No. 3 J. N. LaPointe Double, belt
No. 4 J. N. LaPointe, m.d.

RIVETERS
No. 2A, 3A High Speed Riveting Hammers
¼" Shuster, belt
Hanna Air Riveter, 13" throat
Chicago Pneumatic, 24" throat

Many other machines in stock. Send us your inquiries

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- X-Ray Equipment at Rock Island Arsenal
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- Rear Sights for Browning Machine Guns
- General Motors Methods on 30- and 50-cal. Machine Guns
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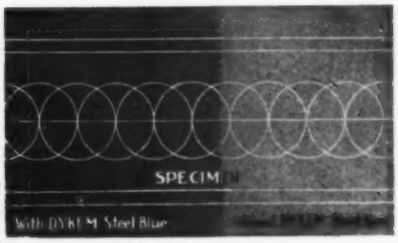

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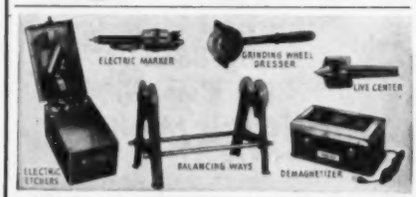

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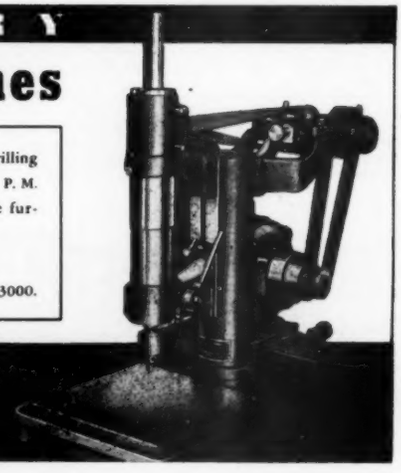

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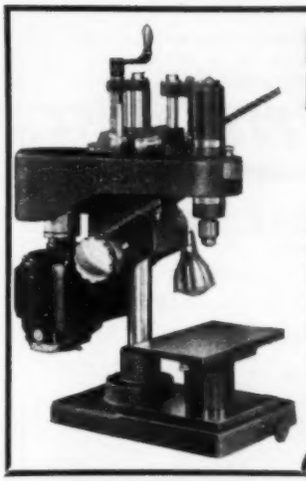

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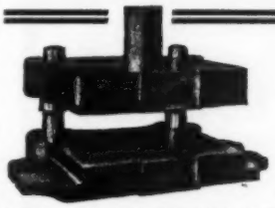

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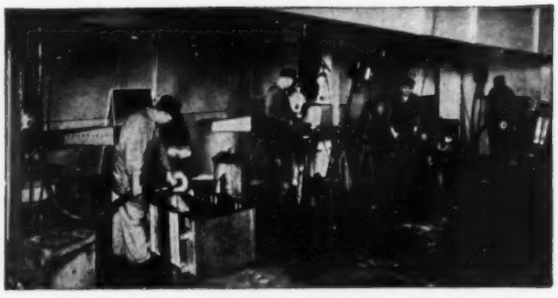

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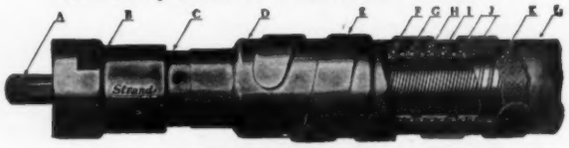

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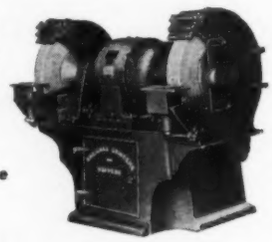

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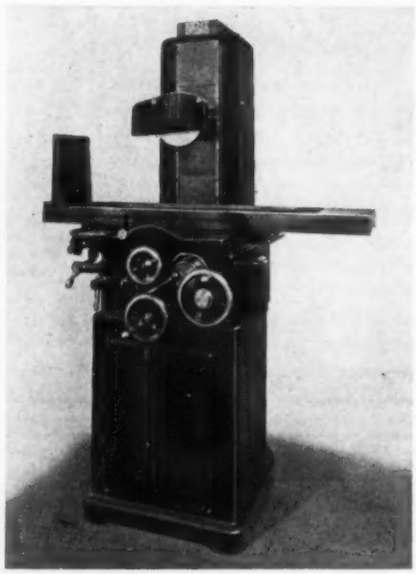

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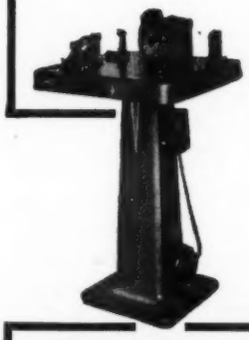
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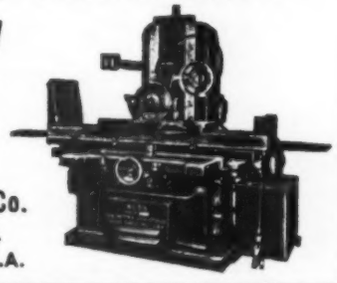
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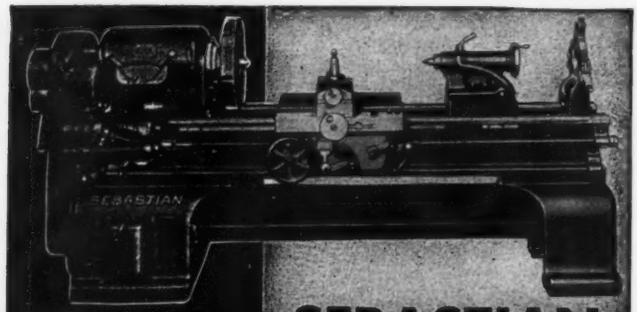

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Wright Mfg. Co. Div. of American Chain & Cable Co., Inc., York, Pa.

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INSTRUMENTS, Optical Inspection
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National Automatic Tool Co., Richmond, Ind.

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Mitts & Merrill, Saginaw, Mich.
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LAMPS, Mercury Vapor
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LAPS, Tool Makers
Producto Machine Co., Bridgeport, Conn.

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LATHES, Special
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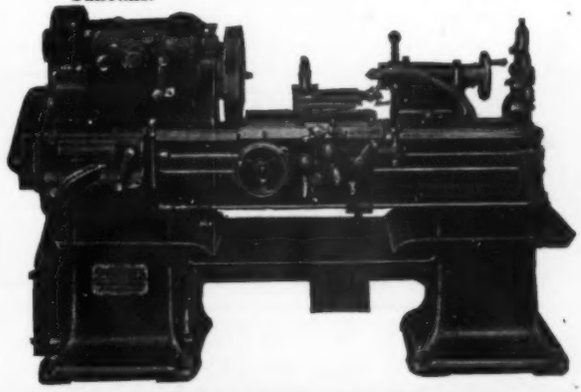

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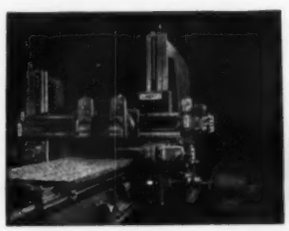

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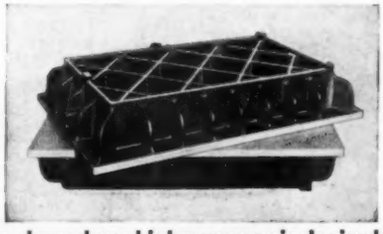

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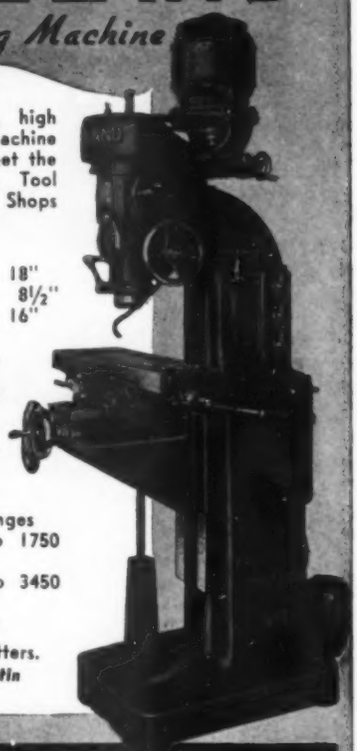

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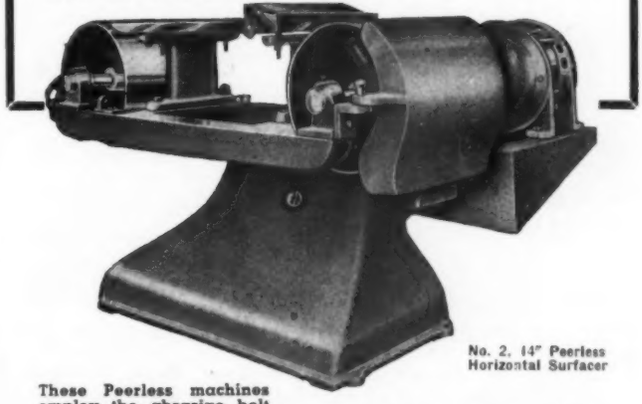

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CRANK SHAPERS
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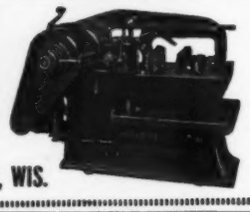

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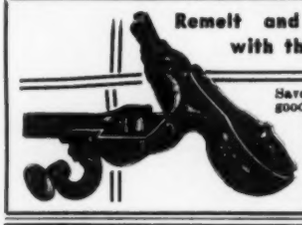

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Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

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Gisholt Machine Co., Madison, Wis.
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Holman Reamer Co., Manchester, Conn.
Union Twist Drill Co., Athol, Mass.

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SAWS, Hack
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Peerless Machine Co., Racine, Wisc.

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Racine Tool & Machine Co., Racine, Wis.

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Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

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Eastern Mach. Screw Corp., New Haven, Conn.

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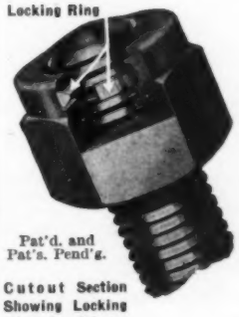

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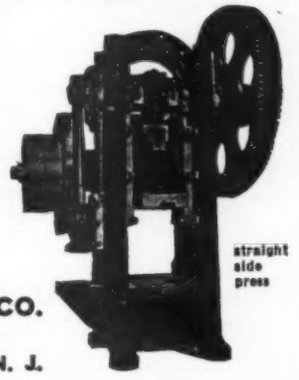

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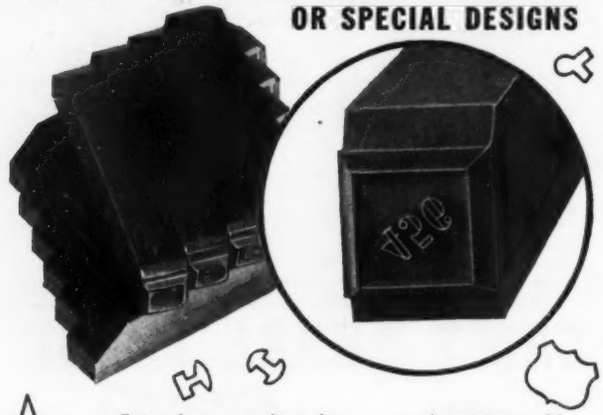

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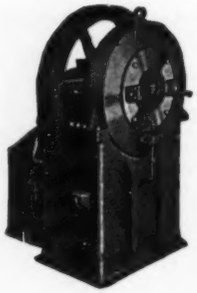

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Eastern Mchy. Co., Cincinnati, Ohio
Emerman & Co., Louis E., Chicago, Ill.
Falk Machinery Co., Rochester, N. Y.
Hill Clarke Machinery Co., Chicago, Ill.
Hyman & Sons, Jos., Phila., Pa.
Indianapolis Mchy. & Supply Co., Indianapolis, Ind.
Iroquois Mchy. Co., Buffalo, N. Y.
Jones Machine Tool Co., Cincinnati.
Lang Machry. Co., Pittsburgh, Pa.
Marsh Machry. Co., A. R., Cleveland
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Strong, Carlisle & Hammond Co., Cleveland, Ohio
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Zeeve & Co., Alex, New York, N. Y.

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VALVES, Air Control
Nicholson & Co., W. H., Wilkes-Barre, Pa.

VERNIERS
Brown & Sharpe Mfg. Co., Providence, R. I.

VISE STANDS
New Britain-Gridley Machine Co., New Britain, Conn.

VISES, Drilling Machine
Armstrong-Blum Mfg. Co., Chicago, Ill.
Fenn Mfg. Co., Hartford, Conn.
Hartford Special Mchy. Co., Hartford, Conn.
Johnson Tool Co., East Providence, R. I.
Sheldon Machine Co., Chicago

VISES, Machine
Armstrong-Blum Mfg. Co., Chicago, Ill.
Fenn Mfg. Co., Hartford, Conn.

VISES, Machinist
Desmond-Stephan Mfg. Co., Urbana, Ohio
Wiedemann Machine Co., Philadelphia

VISES, Milling Machines
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., The, Cincinnati, Ohio
Fenn Mfg. Co., Hartford, Conn.
Hartford Special Mchy. Co., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee, Wis.
Sheldon Machine Co., Chicago

VISES, Pipe
Armstrong Bros. Tool Co., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.

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Barrett Co., Leon J., Worcester, Mass.

WELDERS, Arc
Hobart Brothers, Troy, Ohio

WELDING ELECTRODES
General Electric Co., Schenectady, N. Y.

WELDING MACHINES, Electric Arc
Harnischfeger Corp., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh

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Hobart Bros., Troy, Ohio
Ryerson & Son, Inc., Joseph T., Chicago, Ill.

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General Electric Co., Schenectady, N. Y.

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WRENCHES, Tap
Butterfield Division, Union Twist Drill Co., Derby Line, Vt.
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Chips

Bushing Sweller . . . In our apprentice daze, we were building a simple drilling jig involving a half-dozen 1¼-in. bushings. In those days, we made our own bushings and jigs, and trying to do a particularly good job, we drilled and reamed the top-plate holes, then drove in the bushings —tight. That caused just enough reduction in bushing diameter to make the drill stick. And we had no internal grinder. The Boss' solution was ingenious. He suggested a plug with a sawed slot and a shank to fit a drill chuck. A section of emery cloth caught in the slot and wrapped around the plug then made an effective hone, built up as necessary by adding more cloth as the hole was enlarged. At least it saved one scared apprentice's life for the nonce.

Popular Series . . . Three articles by Roy T. Wise, deputy controller of machine tools for the Canadian Government, on the general subject of increasing tool life, appeared in our issues of Dec. 11, Dec. 25, and Jan. 8. They turned out to be

extremely useful to others beside our usual group of executive readers—to the extent that more than 6000 reprints have been requested. Typical of comments is this one from the assistant general manager of Link-Belt's Pershing Road Plant, "These timely articles will be of great help to many young operators and machinists in doing their bit for America's victory."

Scooters . . . Some of the plants turning out our giant bombers and flying boats are so big that dispatchers, stock boys and messengers use bicycles and small motorized scooters—some of them with sidecars—to travel from one part of the plant to another. Some 300 bicycles are now in use at Consolidated, and additional ones are being purchased at the rate of 30 a week. There are about 150 of the miniature motorcycles now—and more coming.

When They Wire . . . Telegrams still insist on copies of our old Shell Book, now out of print for six months. We gulped at the last two—and surrendered our file copies, because the printer promises faithfully that our big new book, "Artillery and Small Arms Ammunition", will be ready by the time you read this. Twice as thick, it includes all the old data and all the new, but still sells for $1. If you want a copy, please send in your dollar (or dollars) with order, because the buck represents our out-of-pocket cost, and billing is expensive.—E.J.T.

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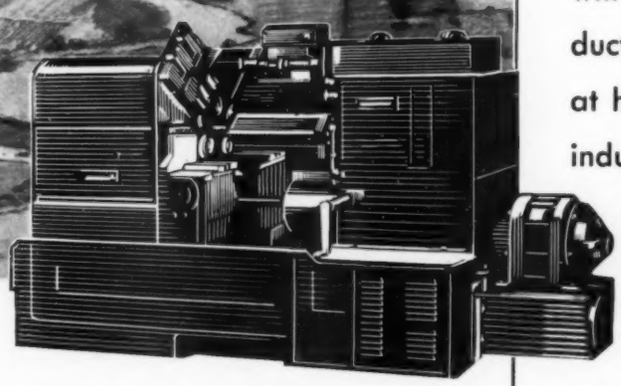
TO FILL THE SKIES WITH WAR PLANES



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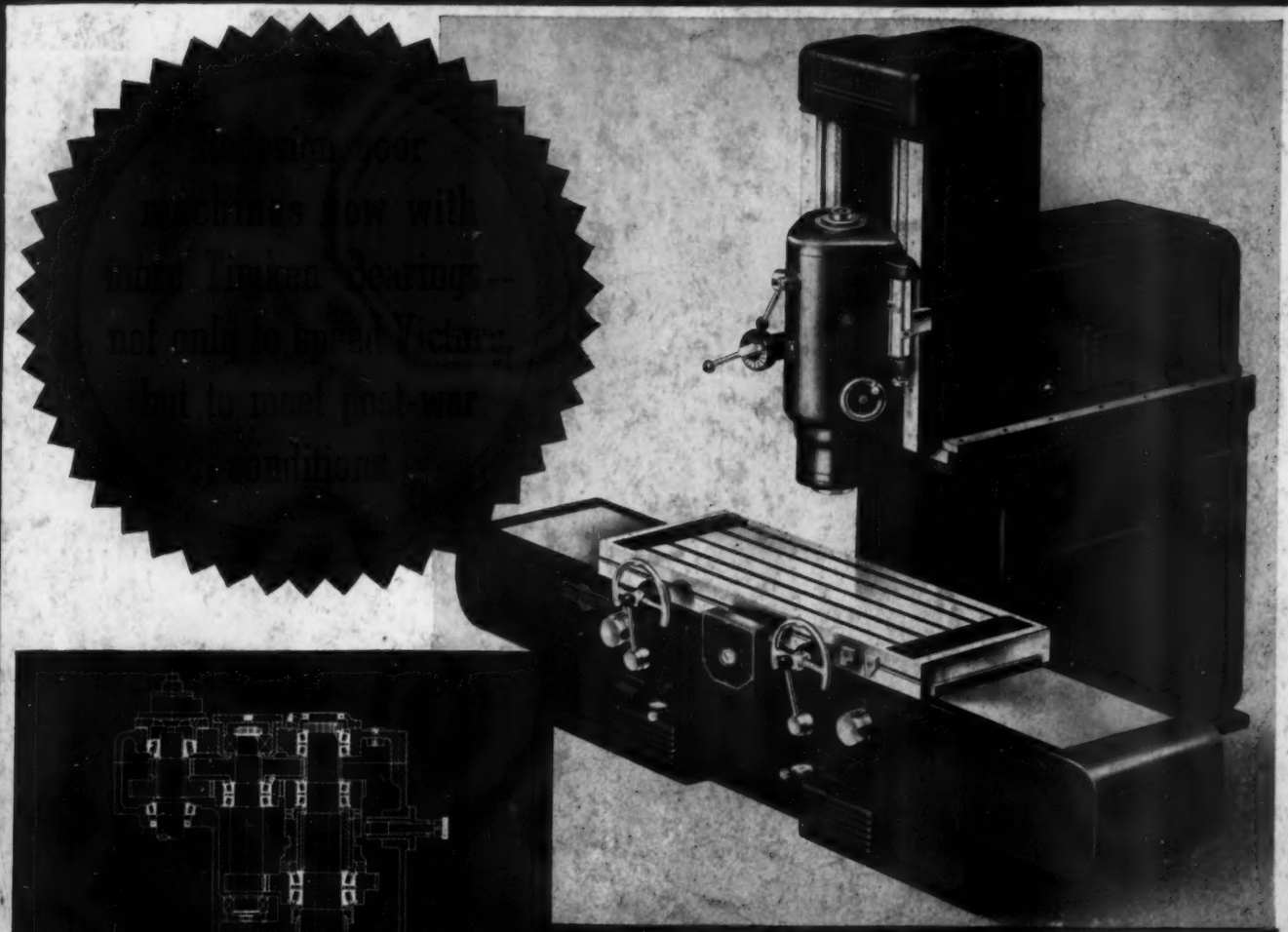

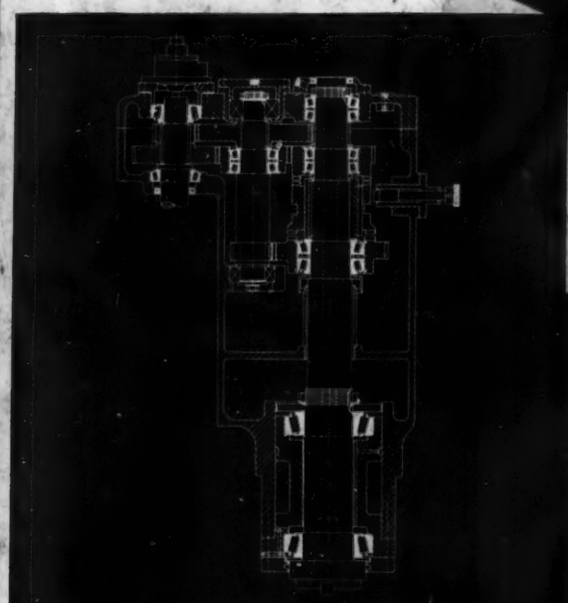

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